An Analysis of Labour Market Earnings for Higher Education Graduates in their Early Careers

Graduation Cohorts: 2010 - 2017

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A Report by the Higher Education Authority

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Glossary

CAO	Central Applications Office
CSO	Central Statistics Office
DEIS	Delivering Equality of Opportunity in Schools
ELD	Educational Longitudinal Database
HE	Higher Education
HEA	Higher Education Authority
HEI	Higher Education Institution
ISCED	International Standard Classification of Education
LC	Leaving Certificate
NCAD	National College of Art and Design
NFQ	National Framework of Qualifications
NDI	National Data Infrastructure
PAYE	Pay As You Earn
PPOD	Post-Primary Online Database
PPSN	Personal Public Service Number
QQI	Quality and Qualifications Ireland
RCSI	Royal College of Surgeons in Ireland
STEM	Science, Technology, Engineering and Mathematics
UBI	Unique Business Identifier

Graduates' earnings are modelled in two ways.

Raw Prediction: The average prediction of graduates' earnings before any attempt is made to explain it.

Model Prediction: Compares like-for-like graduates who:

- studied the same subject/course in the same institution,
- received the same grade,
- are the same gender,
- from the same county,
- attended the same type of second-level school,
- work in the same employment sector,
- accounts for the effect of having children on female earnings,
- enter higher education at the same age (undergraduates only),
- had the same Leaving Certificate performance (undergraduates only) and
- are from the same socio-economic group (undergraduates only).

Legal Framework Underpinning this Research

The CSO provides researchers with access to relevant data holdings, subject to stringent confidentiality criteria, within the framework of the Statistics Act, 1993.

The examination of learners outcomes provided in this report was produced by the HEA under Section 11 of the Statistics Act 1993 using the Educational Longitudinal Database (ELD) data source which was created in compliance with all relevant data protection legislation.

The ELD data source brings together data from the Department of Education and a number of state agencies, including the HEA, QQI and SOLAS, with employment, benefits and earnings data from the Revenue Commissioners and the Department of Social Protection. Access to this data source is strictly limited to Officers of Statistics.

The ELD, provides the basis for a series of projects that the CSO facilitates in strict compliance with the Statistics Act, which allows researchers to further analyse and examine learner outcomes.

The CSO's role is limited to the development of the ELD data source and it is important to note that any analysis, conclusions or recommendations made in this report are the HEA's alone.

Full details relating to the framework for this research work can be accessed through the following links:

Statistical Agreement between the CSO and HEA:
https://www.cso.ie/en/aboutus/lgdp/legislation/memorandumsofunderstanding/statisticalagreementbetweenthecentralstatisticsofficeandthehighereducationauthority/
Statistics Act 1993: http://www.irishstatutebook.ie/eli/1993/act/21/enacted/en/html
Educational Longitudinal Database:
https://www.cso.ie/en/methods/education/educationallongitudinaldatabase/

Executive Summary

This report was developed within the Central Statistics Office, under the legal framework of the Statistics Act 1993. It employs linked administrative data to explore the labour market earnings of higher education graduates in their early careers in Ireland. It provides new evidence on graduates' earnings in their early careers with a focus on differences in earnings by degree subject, institution type, gender and socio-economic background.

Graduates' labour market earnings are influenced by their choice of institution, their subject choice, their grade and their sector of employment. But earnings are also influenced by graduates' background characteristics such as their prior academic attainment and their socio-economic background. Therefore, comparisons of raw earnings across institution types and degree subjects may be confounded by the impact of background characteristics and vice versa. This report attempts to disentangle these effects by modelling earnings to isolate the impact of degree subject, institution type, gender and socio-economic background on graduates' earnings by comparing like-for-like graduates.

The main findings are as follows:

Degree Subject

Undergraduates

- Four years after graduation, undergraduates from Medicine have the highest earnings in terms of both raw and model predictions.
- Other high earning fields of study, in terms of the model prediction, include Statistics, Chemical Engineering & Processes, Medical Diagnostic & Treatment Technology and Other ICT courses.
- Undergraduates from Arts & Humanities fields of study earn the least.

Postgraduates

- In raw terms, postgraduates from Physics have the highest average earnings four years after graduation. However, when like-for-like graduates are compared in the model prediction, Nursing & Midwifery graduates earn the most.
- Other high earning subjects for postgraduates, in terms of the model prediction, include Accounting & Taxation, Electronics & Automation and Software & Applications Development.
- Postgraduates from Arts & Humanities fields of study comprise the five lowest earning subjects (with sufficient sample size to be reported).

Institution Type

Undergraduates

- In raw terms, undergraduates from institutes of technology earn 14 percent less than university graduates four years after graduation.
- Comparing like-for-like individuals, this difference falls to 4 percent.

Postgraduates

- In raw terms, postgraduates from institutes of technology earn 5.5 percent less than university graduates four years after graduation.
- Comparing like-for-like individuals, this difference increases to 9 percent.

Gender

Undergraduates

- In raw terms, female undergraduates earn 4 percent less than males one year after graduating and 14 percent less after eight years. The difference is 9 percent after four years.
- This difference reduces to between 2 and 3 percent when like-for-like graduates are compared.[1]

Postgraduates

- In raw terms, female postgraduates earn 1.5 percent less than males one year after graduating and 15 percent less after eight years. The difference is 8 percent after four years.
- When like-for-like graduates are compared, this difference reduces to between 0 and 3 percent (which is not statistically significant for most years after graduating).[1]

Second-Level School Type

DEIS Schools

Undergraduates

- In raw terms, undergraduates who attended DEIS schools earn around 5 percent less than graduates who attended standard schools one to eight years after graduating.
- This difference reduces to between 0 and 2 percent when like-for-like graduates are compared.[2]

Postgraduates

- In raw terms, postgraduates who attended DEIS schools earn the same one year after graduation and 12 percent less after eight years compared to graduates who attended standard schools. The difference is 3 percent after four years.

[1] Graduates' choice of institution and course explain most of the raw differences in earnings by gender.
[2] Graduates' choice of institution and course explain most of the raw differences in earnings by individuals who previously attended different types of school.

- These differences are generally not statistically significant when like-for-like graduates are compared.[2]

Fee-Paying Schools

Undergraduates

- In raw terms, undergraduates who attended fee-paying schools earn the same as graduates who attended standard schools one year after graduating but they earn 17 percent more after eight years. The difference is 9 percent after four years.
- When comparing like-for-like individuals, these differences are reduced to less than 1 percent after four years (and are not statistically significant) and less than 4 percent after five and six years.[2]

Postgraduates

- In raw terms, postgraduates who attended fee-paying schools earn 2 percent more one year after graduation and 28 percent more after eight years compared to graduates who attended standard schools. The difference is 12 percent after four years.
- When comparing like-for-like individuals, these differences reduce to less than 4 percent for the first six years after graduation.[2]

Limitations

- This report only measures the labour market returns of higher education and fails to capture the wider benefits of higher education to individuals and to society.
- The report only compares earnings of higher education graduates relative to other graduates and does not compare absolute differences in graduates' earnings to non-graduates.
- The relevance of a graduate's qualification to their job is not captured in the data and the region where a graduate is employed is not available.
- The data does not capture individuals who graduate from an Irish HEI and work overseas. In addition, the data does not identify Irish domiciled students who graduate from institutions overseas and subsequently work in Ireland.
- The analysis only covers PAYE income for employees. Self-employment income is excluded.

Note

- Earnings are defined in this report as an individual's weekly gross earnings less tax reliefs such as pension contributions.

1 Introduction

This report employs linked administrative data to explore the labour market earnings of higher education graduates in their early careers in Ireland. Previous work produced by the HEA and CSO focused on graduate outcomes with respect to employment, re-enrolment in education, sector of employment and earnings over time (CSO, 2018). The focus in this report is further in-depth analysis of graduates' early career earnings using regression analysis which takes into consideration prior attainment and background characteristics.

In line with the data confidentiality protocols of the CSO, all data linking and analysis is carried out on pseudonymised datasets using Protected Identifier Keys. The CSO replaces the PPSN for individuals with a proxy that is used to link the HEA's graduation records to the CSO's administrative data. In addition, all identifiable information relating to individuals and employers, such as names and addresses, are removed.

This report provides new evidence on graduates' earnings in their early careers with a particular focus on differences in earnings across four areas. These are degree subject, institution type, gender and socio-economic background. The purpose of this research is three-fold. The first is to contribute to the information available for prospective students on their potential earnings following their choice of subject and type of institution as many students make these decisions at an early age. While many factors will influence what and where students study, an important consideration will be their expected earnings after graduation. This report facilitates granular investigation into subject returns by estimating graduate earnings, four years after graduating, for approximately seventy fields of study.

However, when measuring the earnings impact from studying a particular degree subject in a particular institution type it is important to consider graduates' underlying ability as students with strong ability before entering higher education may be better rewarded by the labour market irrespective of their degree or institution choice. Prior ability and socio-economic background are also likely to influence students' choice of what and where to study. Together, these confound measuring the impact of degree subject and institution type on graduates' earnings. To overcome these issues, this report compares graduates' earnings amongst similar individuals by exploiting a rich set of information on graduates' degrees, prior academic attainment, socio-economic background, sector of employment and an indicator to account for the effect of having children on female earnings.

The second contribution of this report is to add to the literature on the gender pay gap in the graduate labour market in Ireland. Using administrative data, the analysis can describe the overall differences in earnings by gender. Regression analysis is then employed to compare the wage differences between males and females who had the same performance in the Leaving Certificate, are from the same socio-economic backgrounds, studied the same course in the same institution, achieved the same grade, work in the same sector and accounts for the effect of having children on female earnings.

The third contribution is to improve the information available to measure the outcomes for higher education graduates who come from disadvantaged socio-economic backgrounds. Promoting equity of access to higher education has been fundamental to the role of the HEA since its foundation in the early 1970s. While there has been much research concerning access to higher education by students from lower socio-economic backgrounds, little is known about the outcomes for these students after they graduate. This paper attempts to fill this gap by analysing the earnings of graduates who previously attended different types of second-level schools (DEIS, fee-paying and standard schools).

It is worth remembering that there are many benefits of participating in higher education which extends beyond the narrow outcome of earnings in the labour market. For example, there are many personal, social and cultural benefits of participating in higher education which are not measured here such as participating in the Erasmus+ programme, volunteering opportunities and involvement in sports and societies. Nonetheless, prospective students will spend considerable time and resources pursuing a degree and may be interested to know how previous graduates of certain degree subjects performed in the labour market.

2 Background and Related Literature

2.1 Introduction

This section considers the literature related to the student characteristics that are the focus of this report. These are: degree subject, gender and type of second-level school graduates previously attended.

The two main sources of graduates' earnings data in Ireland are surveys of graduates coordinated by the HEA and, more recently, linked administrative data held by the CSO. Using this linked administrative data, the present report follows a previous CSO publication which focused on graduate outcomes with respect to employment, re-enrolment in education, employment sector and earnings over time (CSO, 2018).

Surveys of graduates have been conducted in the First Destination Survey and more recently, in the Graduate Outcomes Survey. The First Destinations Survey, which surveyed university graduates nine months after graduating, was conducted annually since 1982.[3] This has recently been replaced by the Graduate Outcomes Survey (HEA, 2019a) which surveys graduates from universities, colleges and institutes of technology nine months after completing their degrees.

Linking administrative data records of higher education graduates to their earnings from tax records is common internationally. However, it is important to bear in mind that other countries have different graduate information and collect different tax data. In addition, other countries have different education and labour market environments and what is the case for some countries may not necessarily hold true for Ireland.

Administrative data has been available in Scandinavian countries for some time spanning long periods and includes parental background information. This affords the possibility to investigate relationships such as the transmission of education from parents to children (Black, Devereux and Salvanes, 2005) and the relationship between early childhood education and outcomes in later education and the labour market (Havnes and Mogstad, 2011). For an extensive review of international evidence refer to Figlio et al. (2015).

The Department for Education in the UK developed the Longitudinal Education Outcomes administrative dataset which tracks English students from post-primary school, into university and into the labour market (Belfield et al., 2018, 2019).

[3] These have been published online annually by the HEA since 2005 in reports entitled 'What do Graduates Do?' and are available here: http://hea.ie/statistics/publications/

2.2 Returns to Different Fields of Study

The literature clearly shows that there are large variations in graduate earnings across different fields of study. Previous analysis of linked administrative data by the CSO (2018) shows that one year after graduating Education graduates have the highest median earnings followed by Health & Welfare and ICT. By the fifth year after graduating ICT graduates have the highest median earnings followed by Education and Health & Welfare.[4]

The most recent Graduates Outcome Survey, of 2017 graduates, paints a similar picture of earnings by field of study (HEA, 2019a). Education graduates have the highest average salary nine months after graduating followed by Engineering, Manufacturing & Construction, ICT and Health & Welfare graduates.

Belfield et al (2018) find that Mathematics, Economics and Medicine graduates have the highest average earnings in England five years after graduating while Creative Arts graduates have the lowest. Using regression analysis, and accounting for differences in HEI attended, prior attainment and background characteristics, they find graduates from these subjects still earn the largest or smallest amounts but that the differences in earnings across subjects is substantially reduced. For instance, the difference in earnings between a male medicine graduate and an average male graduate falls from 63 percent to 25 percent because differences in student characteristics explain part of the variation in earnings across fields of study.

Previous analysis of earnings by degree subject in Ireland breaks field of study into the ten broad ISCED fields of study while Belfield et al (2018) examines twenty subjects. This report breaks down degree subject further than previously conducted in Ireland into approximately seventy detailed ISCED fields of study, to facilitate granular investigation into the labour market returns of different subjects.

2.3 Gender

Prior to entering higher education, female students tend to outperform their male counterparts in most Leaving Certificate subjects.[5] They subsequently outnumber males graduating from higher education (women comprise 57 percent of graduates analysed in the descriptive statistics in the next section). However, data from Ireland and

[4] It is worth noting that the earnings analysis by field of study in this report is not directly comparable to the CSO (2018) study despite both using the same administrative data. This is because analysis here is based on mean earnings (as regressions are calculated at mean values) instead of median earnings.

[5] In 2006 (four years before the earliest 2010 graduation cohort in this report) girls outperform boys in terms of the proportion achieving a Higher Level A1 grade in all 32 subjects excluding Mathematics, Agricultural Economics, Technical Drawing and Construction Studies. The proportions achieving a Higher Level A1 were equal for Engineering. In 2013 (four years before the latest 2017 graduation cohort in this report) girls outperform boys in all but 6 out of 32 subjects. The statistics are available on the State Examinations Commission website: https://www.examinations.ie/statistics/

internationally show that female graduates earn less when they enter the labour market (HEA 2018; HEA 2019a; CSO, 2018; Belfield et al., 2018).

The wider Irish labour market remains strongly gender segregated by international standards despite the introduction of equality legislation, changes to tax and welfare policies and changes to the culture in relation to women's role in work and the family over the past 50 years (Russell et al., 2017). Furthermore, Russell et al. (2014) finds that there are gender differences in temporary employment, job insecurity, job control and work pressure. Historical data from the CSO shows that the gender pay gap in the industrial sector declined from 40 percent in the 1940s to 25 percent in the 2000s (CSO, 2017). Recent figures from the OECD (2019) estimate that the economy-wide gender pay gap, in *median weekly earnings* for full-time employees, ranges from 8.5 percent to 15 percent between 2011 and 2016.

Much of the economy-wide gender pay gap has been attributed to differentials in labour market experience which is caused by career breaks taken by women for family reasons and child rearing (Connolly and Gregory, 2008). By focusing on young graduates in their early careers in this report, the earnings impact of career breaks for family reasons is limited. Nevertheless, this report can account for the effect of having children on female graduates' earnings.[6]

There remains a gender pay gap in the graduate labour market. CSO (2018) analysis of male and female graduates' earnings in their first year after graduating shows no difference in *median weekly earnings* for graduates in 2010 but males earn 3 percent more than females five years after graduating. Further analysis of earnings, one year after graduating, shows that the gap between males and females *median weekly earnings* rises from no difference for 2010 graduates to 6 percent for 2014 graduates (CSO, 2018). In England, administrative data shows that male graduates earn more than female graduates, in terms of *average annual salary*, and the difference grows over time (Belfield et al., 2018).

Survey data of graduation cohorts from 2013 to 2016 indicate that males earn slightly more than females nine months after graduation in terms of *annual earnings* (HEA, 2018). The Graduate Outcomes Survey (HEA 2019a) calculates that the gender pay gap in *annual earnings* is on average 11 percent nine months after graduating. The gender pay gap falls

[6] However, this report cannot entirely rule out gender differences in the number of hours worked because wages are measured here in terms of weekly earnings. Data from the Labour Force Survey for all workers aged over 15, between 2011 and 2018, shows that females worked on average 20 per cent fewer hours compared to males. More information is available here: https://www.cso.ie/en/statistics/labourmarket/labourforcesurvey/

to 5 percent after controlling for differences in a range of student characteristics such as, field of study, type of institution attended, NFQ level, sector and region of employment.

A survey of 2001 graduates, three years after graduating, finds a gender pay gap of 11 percent in *weekly wages* but virtually no difference in *hourly wages* by gender. However, there is an 8 percent difference in average *hourly wages* of graduates in the private sector and a 4 percent non-significant gap in the public sector (Russell et al., 2010). They also find that the number of hours worked varies by gender. Male graduates work an average of 41.3 hours per week compared to 38 hours for their female counterparts.

There are many possible explanations for why female graduates may earn less than males in their early careers. Russell et al. (2010) suggest discriminatory practices take place in the private sector labour market. They find that male graduates have higher returns on their degree programmes and first-class honours grades, even after controlling for field of study. Similarly, males earn a greater return from previous work experience despite the relevance of such experience being the same for women. However, in light of gender discrimination legislation, Russell et al. (2005) finds no significant gender differences in promotion amongst Irish graduates within the public and private sectors. However, overall male graduates were somewhat more likely to have been promoted compared to females, which is due to the higher proportion of male graduates in the private sector where promotions are more common. Chevalier (2007) finds that the expectation of a future career break for family reasons explains 10 percent of the gender wage gap amongst recent UK graduates.

An important factor in explaining the gender pay gap is the field of study chosen at higher education (Machin and Puhani, 2003; Smyth, 2005; Russell et al. 2010). This is especially important given the role it plays in the differences observed in the gender composition of certain occupations. For instance, Health & Welfare, Education and Arts courses across Europe are dominated by females and Engineering courses are dominated by males which can lead to gender segregation in these occupations (Smyth, 2005). The origin of gender segregation across fields of study in higher education has been linked to subject choices made in secondary school. Delaney and Devereux (2019) attribute most of the explained gender gap in higher education STEM courses to differences in Leaving Certificate subject choices made in secondary schools.

The contribution of this paper to the literature is to exploit a rich set of student characteristics to determine their role in explaining the gender pay gap in the graduate labour market. However, there are gaps in existing administrative data to fully investigate

the determinants of the gender pay gap amongst graduates as the earnings data from Revenue's P35 returns can only identify a graduate's sector of employment and not their occupation or the number of hours worked.

2.4 Second-Level School Type

Promoting equity of access to higher education has been a fundamental principle of Irish higher education policy over the past forty years. There is an extensive body of research on access to higher education in Ireland by students from lower socio-economic backgrounds (Clancy, 1982; Clancy, 2001; O'Connell et al., 2006; McCoy et al., 2010).[7] There have been recent increases in disadvantaged socio-economic groups accessing higher education. The proportion of new entrants to higher education from DEIS schools increased from 12 percent in the 2011/12 academic year to 13.5 percent in 2016/17. Also, between 2011 and 2016, participation rates of new entrants from non-manual and semi/unskilled manual socio-economic backgrounds increased respectively from 23 percent to 27 percent and from 26 percent to 36 percent (HEA, 2018a).

Given the increasing numbers of students from disadvantaged socio-economic backgrounds entering higher education, it is important to track their performance in higher education and their outcomes when they graduate. Previous research has shown that those from lower socio-economic backgrounds (measured by the type of secondary school they attended) are less likely to progress to second year (McCoy et al., 2010b; HEA, 2018b) and are less likely to complete their degree (HEA, 2019).

Moreover, individuals' socio-economic background has been shown to influence what males and females study in secondary school which has implications for accessing higher education. Dilnot (2016) finds large differences in A-level subject choice by social background which has implications for attending the Russell Group of, twenty four large highly selective, UK universities. This is compounded when students from higher socio-economic backgrounds study subjects with high earnings potential. This is reflected later in this report in the descriptive statistics (in Section 4.3) which shows the variation in subject and institution type by the type of second-level school attended.

Numerous studies in the UK show that individuals who have attended a private school go on to have higher levels of educational achievement and also have higher wages (Green et al., 2017). The type of school attended has been shown to matter. Crawford and Vignoles (2014) show that individuals who attended private schools enjoy higher wages compared

[7] Publications from the Access Policy unit in the HEA are available here: https://hea.ie/resource-category/access/publications/

to those who did not. They find that higher education graduates who attended private schools earn 7 percent more on average compared to graduates who attended state schools. This difference was estimated even after comparing otherwise similar graduates who studied the same degree subject in the same university and received the same grade. They find that the private school premium falls to 6 percent when comparing graduates' working in the same occupations.

This report analyses how those from disadvantaged socio-economic backgrounds perform in the labour market in comparison to other graduates. Specifically, graduates' earnings are compared for those who previously attended DEIS, standard and fee-paying schools after accounting for differences in subject choices, prior academic attainment and other graduate characteristics.[8] In doing so, it fills an information void on the outcomes for higher education graduates from disadvantaged socio-economic backgrounds.

[8] Schools are designated DEIS status when a high proportion of its students are from socio-economically disadvantaged areas and receive additional funding with the aim of improving outcomes for these students.

3 Data Description

3.1 Data Linking

The analysis in this report is based on the CSO's Educational Longitudinal Database which uses administrative data to link graduates from higher education in Ireland into the Irish labour market. The data is compiled in the CSO from numerous administrative sources which include earnings data from Revenue, benefits data from the Department of Employment Affairs and Social Protection and data on educational participation from the Department of Education and Skills and a number of State Agencies, including the HEA, QQI and SOLAS.

Under the auspices of the Statistics Act 1993 and in compliance with all relevant data protection legislation, all data linking and analysis is carried out on pseudonymised datasets using Protected Identifier Keys. The CSO replaces the PPSN for individuals with a proxy called the CSOPPSN. It is this proxy that is used to link the HEA's records to the CSO's administrative data sources. In addition, all identifiable information relating to individuals and employers are removed such as names, addresses and date of birth information.

The analysis in this paper uses a part of the ELD that focuses on the HEA's graduation records as the primary information source. This dataset is then linked to the HEA's new entrant records, Revenue's employment records, the Department of Employment Affairs and Social Protection's records and the Department of Education and Skills records on post-primary education (PPOD).

The HEA's graduation records contains information on the year of graduation, institution attended, course studied, type of award, final degree grade, gender and county of origin for graduation cohorts over eight years from 2009/2010 to 2016/2017.

The HEA's new entrant records contain information on students when they register for the first time on a full-time undergraduate course. The data includes the year of entry to higher education, Leaving Certificate points, Leaving Certificate Mathematics and English grades for new entrant cohorts from 2007/2008 to 2014/2015. It also includes information from the Equal Access Survey such as fathers' socio-economic group.[9]

[9] The Equal Access Survey is a voluntary survey administered to all undergraduate new entrants at registration every year. The overall response rates for each academic year from 2007/2008 to 2014/2015 is as follows: 56 percent, 78 percent, 72 percent, 66 percent, 60 percent, 63 percent, 66 percent and 68 percent. Overall survey response rates by institution are published annually in the HEA's Key Facts and Figures publication available here: http://hea.ie/statistics/publications/

Revenue's employment records contain information on individuals' income from their main employment, the number of weeks of insurable work and the sector of employment. The records span eight years from 2011 to 2018.

The Department of Employment Affairs and Social Protection's records contain relationship information between mothers and children born after the year 2000. This is used to construct an indicator identifying mothers of non-adult children. It is important to bear in mind that while this indicator may partly explain some of the differences in earnings by gender it may also partially capture part-time employment amongst females as hours worked are not observed in the data.

The Department of Education and Skills PPOD records contain information, since 2002, on enrolments in second-level schools. From this, the most recent school each student attended before they entered higher education is derived and this is used to determine the HP deprivation index score of the school's Electoral Division.[10] The most recent second-level school that students attended are divided into three types of school (standard, DEIS and fee-paying schools) as a proxy measurement of graduates' socio-economic background.

Table 1 shows the timeline of data availability for the PPOD, new entrant and graduation records. Sufficient time must elapse to join a student's PPOD and new entrant records to their graduation record. Eight years of PPOD records (from 2001/02 academic year) are available before the first graduates are observed in 2010. This means that the type of second level school that graduates previously attended can be observed for both undergraduates and postgraduates over all graduation cohorts. New entrant records are only available from 2008, meaning that sufficient matches to graduation records only occur from 2012, which coincides with the average length of a four-year Honours Bachelor degree. As the length of time for postgraduate study is longer, their new entrant information is excluded when analysing their earnings.

Table 2 shows the years of earnings data that are observed for each graduation cohort. For example, eight years of earnings data (from 2011 to 2018) are observed for the 2010 graduation cohort (one to eight years after graduating). One year of earnings data (2018) is observed for the 2017 graduation cohort (one year after graduating). The shaded area shows the (post 2012) graduation cohorts and years of earnings data for which new entrant information is available.

[10] The HP deprivation index is a composite index of demographic, social class and labour market indicators in the 2016 Census. Further information is available here: https://www.pobal.ie/app/uploads/2018/06/The-2016-Pobal-HP-Deprivation-Index-Introduction-07.

Table 1: Timeline of Data Availability

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
PPOD (Academic Year)	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14			
New Entrant (academic year)							07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15		
Graduation Cohort									**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**

Table 2: Timeline of Earnings Data

		Years of Earnings Data (and Years Since Graduation)							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Graduation Cohort	**2010**	2011	2012	2013	2014	2015	2016	2017	2018
	2011	2012	2013	2014	2015	2016	2017	2018	
	2012	2013	2014	2015	2016	2017	2018		
	2013	2014	2015	2016	2017	2018			
	2014	2015	2016	2017	2018				
	2015	2016	2017	2018					
	2016	2017	2018						
	2017	2018							

Note: The shaded area shows the graduation cohorts (post 2012) for which new entrant information is available to analyse earnings.

3.2 Description of Earnings Data

Earnings data are sourced from Revenue's P35 returns, which employers file annually on behalf of their employees, and contains information on PAYE income. Earnings in this report are defined as an individual's income which is liable to income tax.[11] An individual's annual earnings information is not necessarily directly observed on the tax records because individuals may have more than one job in a calendar year and the data includes one record for each job. Each record includes the number of weeks of insurable work and the pay received by the employee. The data does not include the number of hours worked or the hourly wage. Earnings from self-employment are not analysed in this report because there is a longer lag in its availability and there are difficulties in interpreting a consistent measure of individuals' income from their sales, profit and turnover.

[11] It is thus the total income of taxpayers less personal reliefs (such as pension contributions) and other deductions at the marginal tax rate but prior to the application of tax credits and reliefs at the standard tax rate (such as health expenses).

It is preferable to analyse weekly earnings rather than annual earnings because individuals may work for different periods of time, in different jobs, in a calendar year. To calculate weekly earnings, a main employment (or job) is identified for each individual as the one which contributes the single largest pay to that individual over the course of the year. An individual's average weekly earnings is calculated for this main employment as their gross pay divided by their number of weeks of insurable work for this employment. Earnings are adjusted for inflation by multiplying by a factor based on the Consumer Price Index (CPI, base=December 2016).

To ensure that short-term or casual work is excluded, graduates' earnings are only analysed for individuals who are in 'substantial employment'. An individual is regarded as being in substantial employment within a given calendar year if they fulfil the following two requirements:

1. They have at least 12 weeks of insurable work within the calendar year across all employments. This can be supplemented by weeks of maternity leave and/or illness leave.
2. The average weekly earnings from only their main employer is at least €100 per week.

It is worth noting that while the definition of earnings remains the same, the analysis of earnings in this report is not directly comparable to the CSO (2018) study. This is because analysis here is based on mean earnings (as regressions are calculated at mean values) instead of median earnings.

3.3 Description of Student Characteristics

Below is a list of all student characteristics that are accounted for in this analysis, grouped together into eight categories. Variables marked with an asterisk (*) are only included for undergraduate models as they are sourced from the new entrant record of individuals' first full-time enrolment in higher education. Appendix B contains further information about these student characteristics variables.[12]

1. Graduation Cohort
   - Graduation cohorts (2010, …, 2017)
2. HEI and Subject
   - Institution or institution type (detailed in Table B.2)
   - Field of study (detailed in Table B.4) or course name
3. Degree Characteristics
   - Award type (Ordinary Degree, Honours Degree, Masters, PhD etc.)
   - Final degree grade
4. Demographic Characteristics
   - Gender
   - County of origin (including Dublin postcodes)
   - Age at entry to higher education*
5. Prior Academic Attainment
   - Leaving Certificate points (155-200, 205-250, …, 555-600)*
   - Leaving Certificate Mathematics grade*
   - Leaving Certificate English grade*
6. Socio-economic Background
   - Second-level school type (DEIS, fee-paying and standard)
   - HP relative deprivation index score of schools' Electoral Division
   - Students' socio-economic group (based on fathers' occupation)*
7. Mother Information
   - Indicator of motherhood
8. Sector of Employment
   - NACE sector of employment

[12] All variables are categorical and Table B.5 shows these categories and the shares of each category (mostly) with respect to the `Earnings Sample' for all graduation cohorts (column 6 in Table A.2).

3.4 Administrative Data versus Survey Data

Other sources of graduates' earnings data for Ireland are the First Destinations Survey and the Graduate Outcomes Survey which surveys graduates nine months after completing their degrees.[13] Response rates are strong for these types of survey at over 60 percent for the First Destinations Survey and over 50 percent for the Graduate Outcomes Survey. However, the response rate for earnings is substantially lower, ranging between 19 and 31 percent for Honours Degree graduates between 2013 and 2016.

Administrative data has several advantages over survey data. Population-level coverage allows estimates to be calculated with greater precision and enables analysis of specific sub-sections of the population while retaining sufficient sample size. Administrative data examines the same individual over multiple periods in time creating a panel dataset over a long time series which provides insight into earnings growth in graduates' early career years rather than just at a specific point in time. In addition, administrative data (such as earnings) is largely free from measurement error such as self-recall bias, non-response bias or, in the case of panel data, attrition bias.[14]

However, there are limitations. Administrative data is collected separately to administer the higher education sector and the tax system and not with the sole intention of analysing the outcomes of graduates from higher education. For example, the perceived relevance of a graduate's qualification to their area of employment cannot be examined and the region where graduates are employed cannot be identified from the data.[15]

This report only extends to individuals who graduate from an Irish HEI who subsequently work in Ireland. Therefore, the data does not capture individuals who graduate from an Irish HEI and work outside the State.[16] In addition, the data cannot identify Irish domiciled individuals who graduate from institutions outside of Ireland and subsequently return to work in Ireland.[17]

[13] These reports are available on the HEA website at: http://hea.ie/statistics/publications/
[14] Attrition bias can be significant. The response rate was 44 percent amongst 2007/08 graduates in the UK who were followed up after three and a half years (Crawford and Vignoles, 2014).
[15] Nevertheless, the region of employment can be considered an outcome of attending a particular HEI insofar as a student chooses to relocate to a HEI in a strong labour market region, with the intention of remaining there after graduation.
[16] Survey data of Irish university graduates indicates that nine months after graduating with an Honours Degree, the proportion employed overseas range from 9 percent in 2011 to 12 percent in 2013, and 8 percent in 2016. For Masters and Doctorate graduates these range from 13 percent in 2011 to 15 percent in 2016 (HEA, 2018).
[17] For instance, almost 11,000 students of Irish domicile were enrolled in UK universities in the 2014/15 academic year. Further information is available here: https://www.hesa.ac.uk/data-and-analysis/students/where-from

3.5 Sample Selection

The CSO's Educational Longitudinal Dataset contains the population of graduations from HEA-funded institutions. A number of restrictions are applied before arriving at the sample used in this analysis. Full details of the sample selection process are given in Appendix A.

RCSI graduates and non-Irish domiciled individuals are excluded due to high rates of missing PPSN identifiers among these groups, which is required for matching to other administrative data sources. In addition, small numbers of graduation records are excluded from generic programmes (ISCED code 0) and a small number of graduations records are excluded for individuals who had more than one graduation in the same year.

It is important to note that one-fifth of individuals have received more than one graduation between the years 2010 and 2017. This report attributes individuals' earnings only with their latest graduation and thus, removes individuals' earlier graduations. This is to ensure that analysis is based on unique individuals rather than multiple graduations that relate to the same individual.

The sample is then restricted to full-time young graduates to enable the report to focus on the cohort of graduates who are attending higher education soon after leaving secondary school. Around 5 percent of the remaining sample (of full-time young graduates) is missing a CSOPPSN identifier which prevents these graduations being matched to the CSO's administrative databases.[18] Graduates in substantial employment, in any particular year, then form the basis of the sample used for analysis.

[18] To guard against the possibility that CSOPPSN is missing in a non-random fashion, all estimates are weighted by institute, award type and graduation cohort. Full description of the weighting method is given in Appendix D.

4 Descriptive Statistics

4.1 Introduction

This section presents descriptive analysis of important interactions that may help to explain observed differences in graduates' earnings. Differences in students' choice of degree subject and institution type are shown by gender, by the type of second-level school they previously attended and by their Leaving Certificate points. Average earnings over time then show the variation in earnings across these student characteristics.

4.2 Differences in Subject and Institution Type by Gender

Male and female graduates' earnings are analysed in detail in this report. This subsection shows how detailed field of study and institution type varies by gender and demonstrates the importance of accounting for these later in regression analysis of earnings by gender.

4.2.1 Differences in Subject by Gender

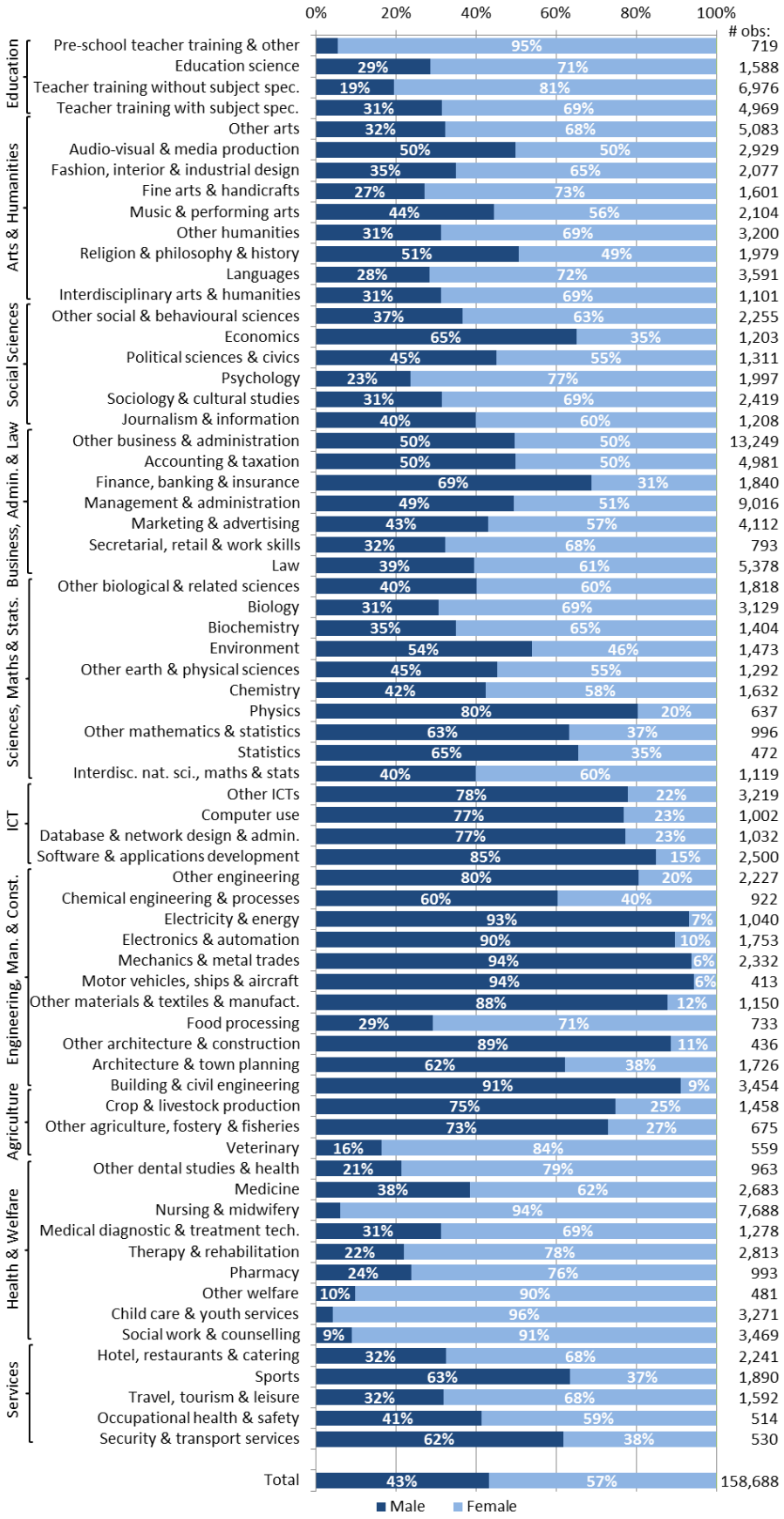
Figure 1 shows that there are stark differences in the subjects studied by male and female graduates. Some of the variation in graduates' earnings by gender may be explained by field of study to the extent that males and females choose to study different subjects which have different earnings potential.

Engineering, Manufacturing and Construction is the most male dominated field of study with males comprising over 90 percent of some graduates. ICT and Agriculture subjects (excluding Veterinary) are also heavily male dominated where around three-quarters of graduates are male. Other subjects with large proportions of male graduates include Physics (80 percent), Finance, Banking & Insurance (69 percent), Economics (65 percent), Statistics (65 percent), Other Mathematics (63 percent) and Sports (63 percent).

Meanwhile females account for the vast majority (around 95 percent) of graduates in Training for Pre-school Teachers, Child Care & Youth Services and Nursing & Midwifery. Around 7 in 10 graduates from Education courses are female. Other fields of study such as Arts, Humanities, Social Sciences (excluding Economics), Biology, Veterinary and Welfare are also predominantly comprised of females.

An advantage of exploiting a detailed breakdown of field of study is that it enables identification of subjects in male dominated areas with substantial female participation and vice-versa. An example includes Engineering, Manufacturing & Construction which overall is heavily male concentrated, but Food Processing and Architecture & Town Planning are comprised of 71 and 38 percent females, respectively.

Figure 1: Detailed Field of Study Distribution by Gender



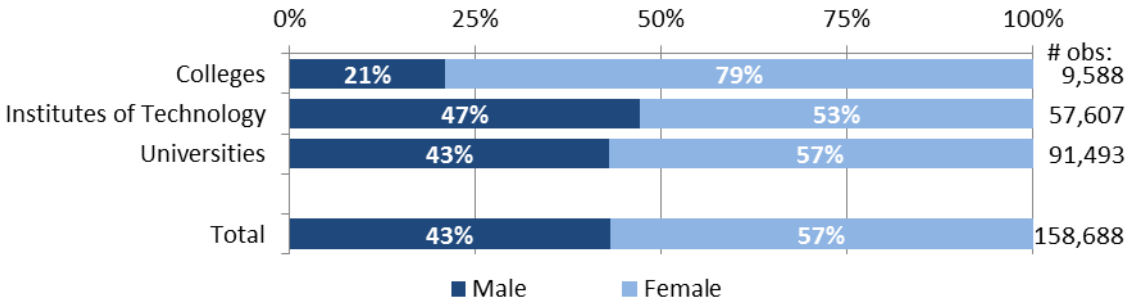
Note: The number of observations is shown and is based on the 'Earnings Sample' for graduation cohorts from 2010 to 2017 (column 6 in Table A.2).

4.2.2 *Differences in Institution Type by Gender*

The concentration of male and female graduates varies across the type of institution, as shown in Figure 2. The gender breakdown of university graduates reflects the overall graduate distribution where 43 percent are males and 57 percent are females. There are proportionally more males (47 percent) graduating from institutes of technology compared to the overall distribution.

Nearly four-in-five graduates from colleges are female. The prevalence of females graduating from art, design and educational courses shown in the previous figure explains the high proportion of females graduating from colleges. The college sector is comprised of NCAD, which largely offers art and design courses, and education training colleges (Mary Immaculate College, Mater Dei Institute of Education, St. Angela's College of Home Economics and St. Patrick's College).

Figure 2: Distribution of Institution Type by Gender



Note: The number of observations is shown and is based on the 'Earnings Sample' for graduation cohorts from 2010 to 2017 (column 6 in Table A.2). The institutions comprising each institution type is listed in Appendix B.

4.3 Differences in Subject and Institution Type by Second-Level School Type

The type of second-level school that graduates previously attended is used in this report as a proxy measurement of socio-economic background. This subsection shows how field of study and institution type varies with the type of school previously attended and demonstrates the importance of accounting for these choices in regression analysis of earnings by socio-economic background.

4.3.1 *Differences in Subject by Second-Level School Type*

Graduates' field of study, from the period 2010 to 2017, is broken down by the type of second-level school they attended prior to entering higher education in Figure 3. Overall, three quarters (74 percent) of graduates attended a standard second-level school prior to

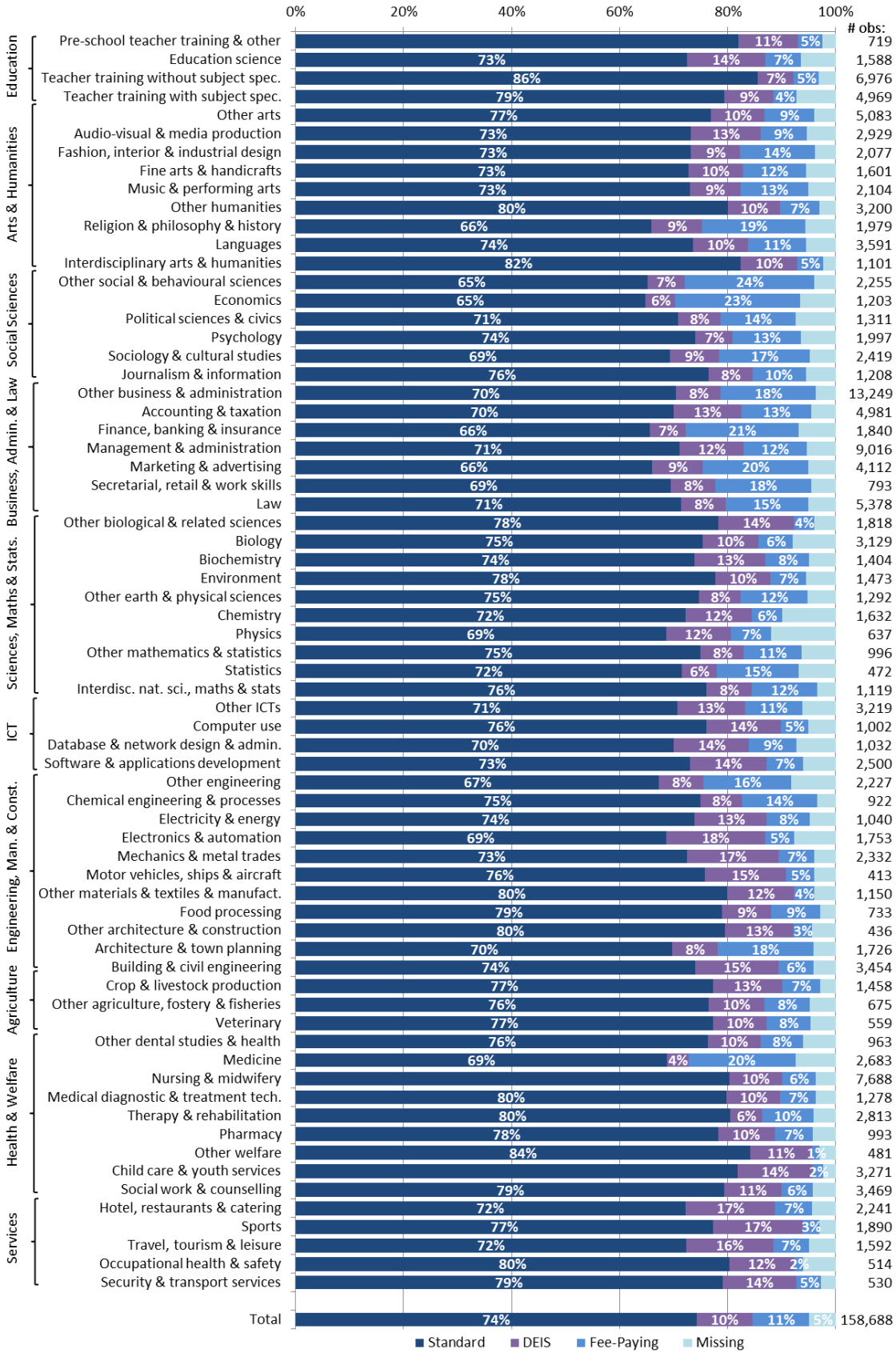
entering higher education. The proportions of graduates who attended DEIS schools and fee-paying schools prior to entering higher education are both around one-in-ten.[19]

The distribution of graduates who attended DEIS and fee-paying schools differ substantially across different fields of study. In broad terms, the fields of Engineering, Manufacturing & Construction and Services have proportionally more graduates who attended DEIS schools and proportionally less who attended fee-paying schools. For example, 18 percent of graduates from Electronics & Automation and 17 percent of graduates from Mechanics & Metal Trades, Hotel, Restaurants & Catering and Sports previously attended a DEIS school. Less than 7 percent of graduates from these subjects previously attended a fee-paying school.

The reverse is broadly true for Humanities and Business, Administration & Law. Over 20 percent of graduates from Other Social & Behavioural Sciences, Economics, Finance, Banking & Insurance, Marketing & Advertising and Medicine previously attended fee-paying schools. This compares to less than 7 percent of graduates from these courses who previously attended DEIS schools.

[19] Note that the type of second-level school is missing for 5 percent of graduates and these are included in calculations here because these missing values are included in regression models as a missing category.

Figure 3: Detailed Field of Study Distribution by Second-Level School Type



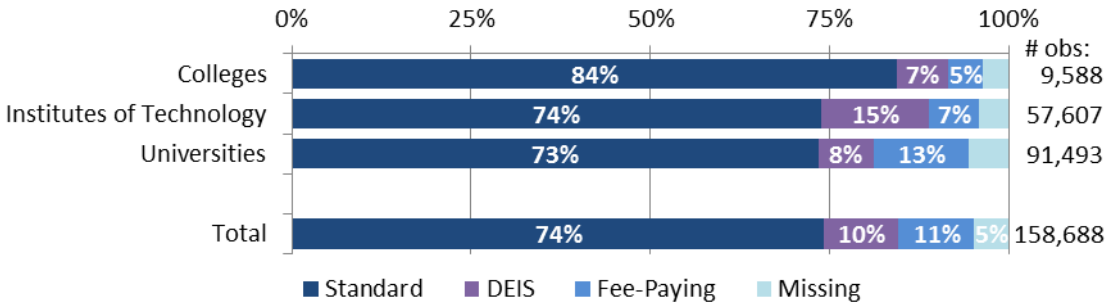
Note: The number of observations is shown and is based on the 'Earnings Sample' for graduation cohorts from 2010 to 2017 (column 6 in Table A.2). Type of school is missing for 7,675 individuals or 5 percent of this sample and are included here and in the regression analysis as a missing category. Further detail on missing values is provided in Appendix B.

4.3.2 *Differences in Institution Type by Second-Level School Type*

Graduates' type of institution is broken down by the type of second-level school they attended prior to entering higher education in Figure 4. Overall, a similar proportion of graduates previously attended a DEIS or fee-paying school (10 percent and 11 percent, respectively).

For universities, more graduates attended a fee-paying school compared to a DEIS school (13 percent compared to 8 percent). The reverse is true for institutes of technology and colleges. In institutes of technology 15 percent of graduates attended a DEIS school compared to 7 percent who attended a fee-paying school. In colleges, proportionally more graduates attended a standard school compared to all graduates (84 percent compared to 74 percent) while 7 percent attended a DEIS school and 5 percent attended a fee-paying school.

Figure 4: Distribution of Institution Type by Second-Level School Type



Note: The number of observations is shown and is based on the 'Earnings Sample' for graduation cohorts from 2010 to 2017 (column 6 in Table A.2). Type of school is missing for 7,675 individuals or 5 percent of this sample and are included here and in the regression analysis as a missing category. Further detail on missing values and the institutions comprising each institution type is provided in Appendix B.

4.4 Differences in Leaving Certificate Points for Undergraduates

Leaving Certificate points are used in this report as a measurement of academic attainment prior to higher education. After meeting basic matriculation requirements, most students analysed in this report are allocated places in higher education courses solely on the basis of their Leaving Certificate points. It is likely that high-achieving students in the Leaving Certificate may self-select into high achieving courses which subsequently have promising job prospects.

This subsection shows how detailed field of study, institution type, gender and second-level school type varies with Leaving Certificate points and demonstrates the importance of accounting for prior academic achievement using regression analysis. Analysis of points is restricted to graduates of undergraduate programmes only as the information is

obtained from an individual's record upon first registering in higher education and this coverage is limited for postgraduates (as detailed in Section 3.1).

4.4.1 Differences in Leaving Certificate Points by Subject

Entry to the majority of places on courses is based on prior academic performance so graduates' Leaving Certificate points vary considerably across subjects. Entry requirements vary from one field of study to another, and thus, so too does the Leaving Certificate performance of graduates across these fields. The majority of undergraduates achieved 355 to 500 points in their Leaving Certificate.[20]

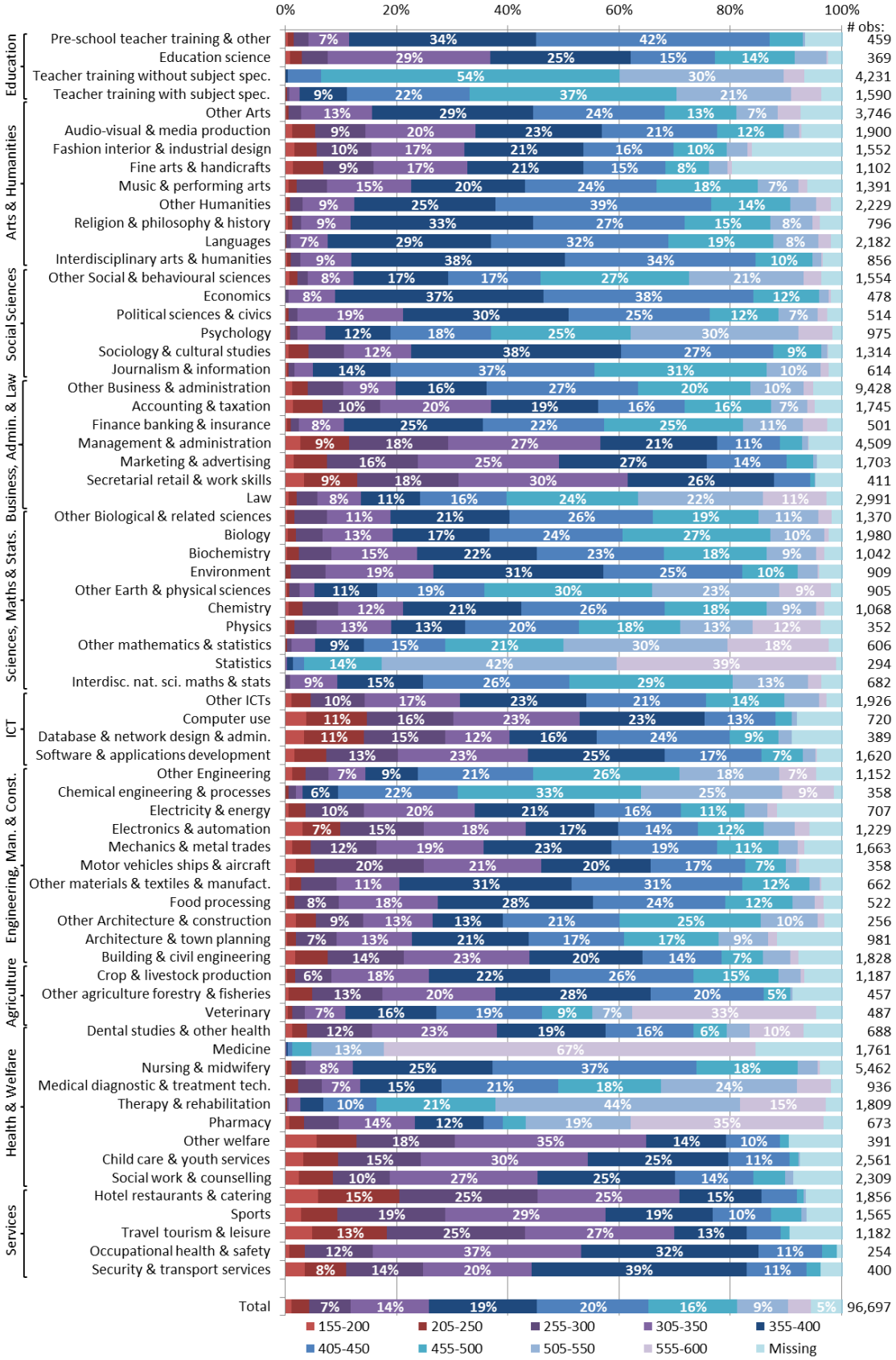
Graduates generally enter higher education with lower points in fields of study in Business (Law and Finance, Banking & Insurance are exceptions), Welfare and Services. Subjects where the majority of graduates attain 350 points or lower include Hotel, Restaurants & Catering (71 percent), Travel, Tourism & Leisure (70 percent), Other Welfare (65 percent), Secretarial, Retail & Work Skills (62 percent), Management & Administration (57 percent), Sports (58 percent) Childcare & Youth Services (54 percent), Occupational Health & Safety (53 percent) and Computer Use (53 percent).

Graduates from Medicine have the highest prior attainment where 67 percent of graduates achieved 555 points and above (Note that Leaving Certificate points is missing for 15 percent of Medicine graduates).[21] Other Fields of study with high proportions of graduates achieving 555 points and above (excluding missing values) include Statistics (39 percent), Pharmacy (35 percent) and Veterinary (33 percent).

[20] Calculation of Leaving Certificate points is detailed in Appendix B. It is worth noting that that bonus points for Mathematics is excluded as most of the higher education graduates analysed in this report sat the Leaving Certificate prior to its introduction in 2012.

[21] 5 percent of Medicine graduates achieved less than 500 points. It is worth noting that other courses such as neuroscience and physiology are included in the Medicine field of study. Also, Leaving Certificate points are missing for 15 percent of Medicine graduates. As detailed in Section 3.1, points information comes from a student's new entrant record, and the longer length of time it takes to graduate from a Medicine course reduces the elapsed time to link this information to the graduation record.

Figure 5: Leaving Certificate Points Distribution for Undergraduates by Subject

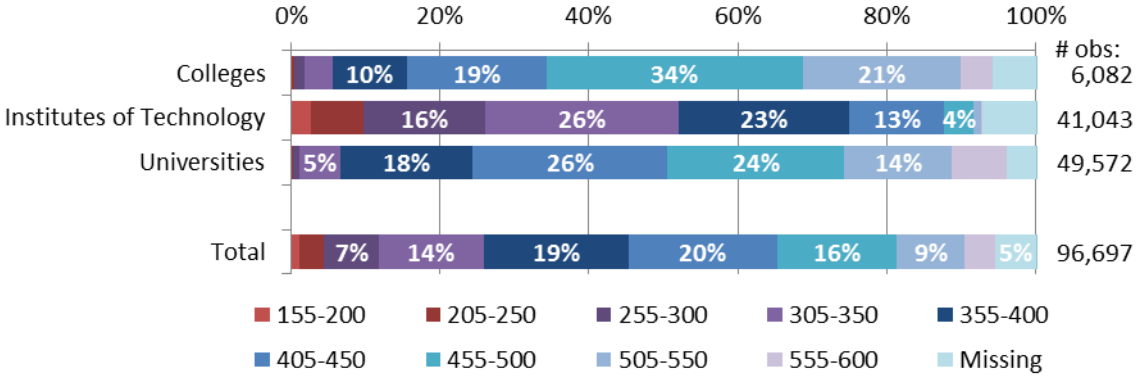


Note: The number of observations is shown and is based on the 'Earnings Sample' for undergraduate graduation cohorts from 2012 to 2017 (column 1 in Table A.3). Leaving Certificate points are missing for 5,290 or 5 percent of this sample and are included here and in the regression analysis as a missing category. Further detail on missing values is provided in Appendix B.

4.4.2 *Differences in Leaving Certificate Points by Institution Type*

Entry requirements differ across institutions so, the distribution of Leaving Certificate points varies by the type of institution, as shown in Figure 6. Undergraduates from colleges achieved the highest Leaving Certificate points overall while graduates from universities also achieved Leaving Certificate points above average. Graduates from institutes of technology attained lower points than the average for all graduates.

Figure 6: Leaving Certificate Points Distribution for Undergraduates by Institution Type

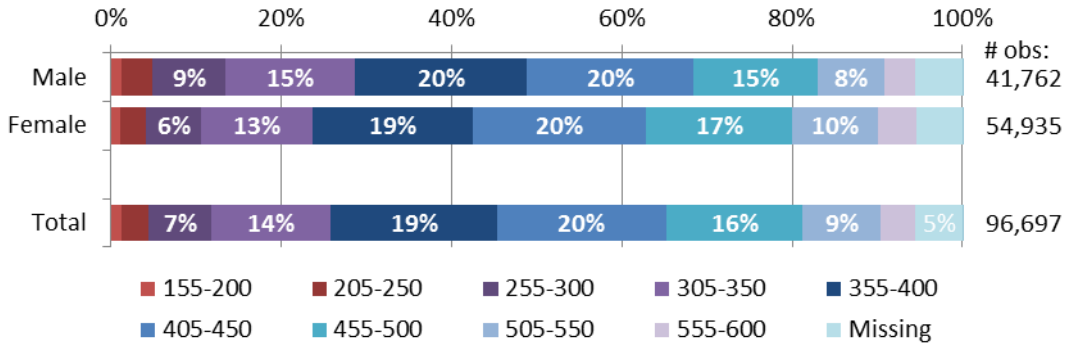


Note: The number of observations is shown and is based on the 'Earnings Sample' for undergraduate graduation cohorts from 2012 to 2017 (column 1 in Table A.3). Leaving Certificate points are missing for 5,290 or 5 percent of this sample and are included here and in the regression analysis as a missing category. Further detail on missing values and the institutions comprising each institution type is provided in Appendix B.

4.4.3 *Differences in Leaving Certificate Points by Gender*

Figure 7 shows that on average female graduates entered higher education with slightly higher Leaving Certificate points than males. 32 percent of females attained 455 points or higher compared to 26 percent of males (excluding missing values). On the other side of the points scale, 14 percent of males score 300 points or lower compared to 11 percent of females.

Figure 7: Leaving Certificate Points Distribution for Undergraduates by Gender



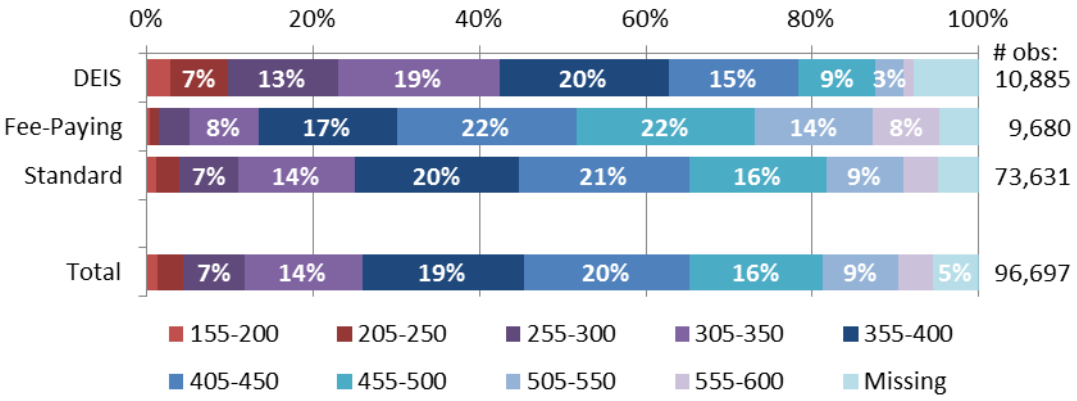
Note: The number of observations is shown and is based on the 'Earnings Sample' for undergraduate graduation cohorts from 2012 to 2017 (column 1 in Table A.3). Leaving Certificate points are missing for 5,290 or 5 percent of this sample and are included here and in the regression analysis as a missing category. Further detail on missing values is provided in Appendix B.

4.4.4 *Differences in Leaving Certificate Points by Second-Level School Type*

Graduates who previously attended DEIS schools are more likely to have lower Leaving Certificate points compared to graduates who attended other schools. The reverse is true for graduates who previously attended fee-paying schools. This demonstrates the importance of accounting for the differences in Leaving Certificate points when analysing outcomes for graduates who attended different types of schools.

63 percent of graduates who attended DEIS schools score 400 points or lower compared to 30 percent who attended fee-paying schools and 45 percent from standard schools (excluding missing values). Similarly, 5 percent of graduates from DEIS schools achieve 505 points and above compared to 22 percent of graduates from fee-paying schools and 13 percent from standard schools.

Figure 8: Leaving Certificate Points Distribution for Undergraduates by Second-Level School Type



Note: The number of observations is shown and is based on the 'Earnings Sample' for undergraduate graduation cohorts from 2012 to 2017 (column 1 in Table A.3). Leaving Certificate points are missing for 5,290 or 5 percent of this sample and are included here and in the regression analysis as a missing category. 2,501 missing values for school type are excluded from the figure and calculations. Further detail on missing values is provided in Appendix B.

4.5 Average Earnings across Student Characteristics

This subsection shows the trajectory of average earnings over eight years, separately for undergraduates and postgraduates, across characteristics such as field of study, institution type, gender, type of second-level school attended, Leaving Certificate points and Leaving Certificate Mathematics and English grades. However, the figures that follow are purely descriptive and do not account for other student characteristics that may interact to determine wages. Examples of such interactions are shown in the previous section such as, differences in students' choice of degree subject by gender and second-level school type.

It is worth reiterating that the earnings analysis in this report is not directly comparable to the CSO (2018) study despite both using the same administrative data. This is because descriptive analysis here is based on mean earnings instead of median earnings.

Average weekly earnings for each year after graduating are shown for combined graduation cohorts. To explain, average earnings one year after graduation include all graduation cohorts from 2010 to 2017 while average earnings two years after graduation includes cohorts from 2010 to 2016 and so on until earnings eight years after graduation includes only the 2010 cohort. The exception is Figure 9 which shows earnings by graduation cohort.

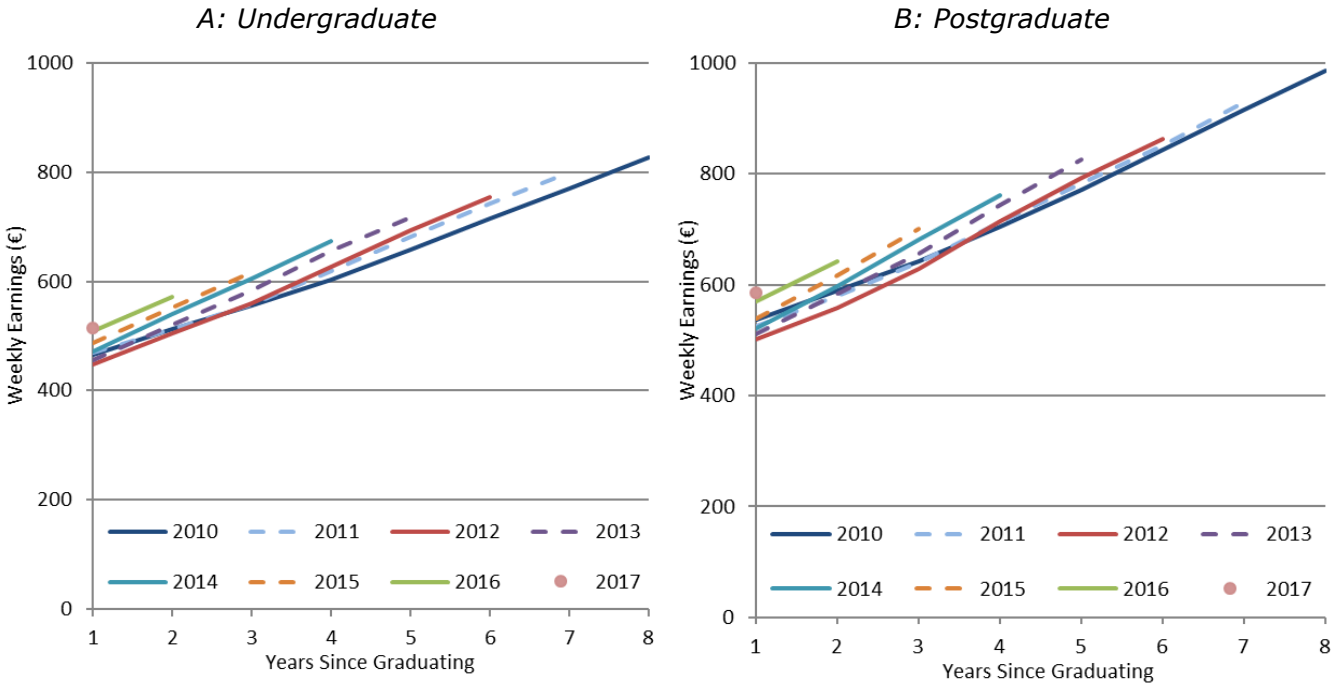
4.5.1 Average Earnings by Graduation Cohort

Average weekly earnings for each graduation cohort from 2010 to 2017 are shown in Figure 9. It shows how the economic cycle affected the trajectory of earnings for different cohorts of graduates. The earnings trajectory is similar for both undergraduates and postgraduates.

Undergraduates who graduated in 2010 earned €466 on average per week after one year while postgraduates earned €536 on average per week. Undergraduates who graduated in 2012 and 2013 earned slightly less after one year while postgraduates who graduated from 2011 to 2014 also earned less after one year than their counterparts who graduated in 2010. This perhaps reflects the deteriorating conditions in the graduate labour market during this time.

However, each graduation cohort generally experiences slightly higher average wage growth compared to the previous cohort. The result is that the most recent graduation cohort earns the most three to four years after graduating.

Figure 9: Average Weekly Earnings by Graduation Cohort (€)



Note: Earnings are conditional on substantial employment and relate to real values in terms of 2016 consumer prices (using the headline Consumer Price Index). Calculations are based on the sample for each respective year since graduating in columns 2 – 9 in Table A.3 for undergraduates and Table A.4 for postgraduates.

4.5.2 Average Earnings by Field of Study

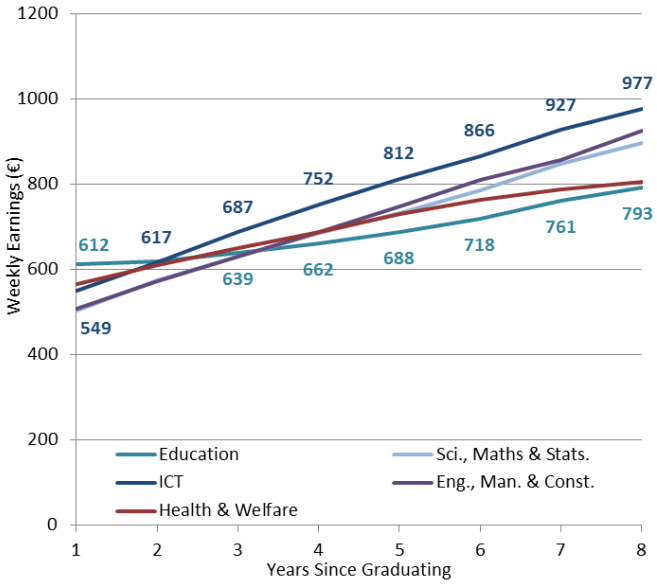
There are considerable differences in undergraduate average weekly earnings by broad field of study, as shown in Figure 10. For readability, the fields of study are displayed across two figures according to their earnings one year after graduating.

Undergraduates from Education courses earn the highest amount one year after graduating, earning €612 on average per week. This is followed by Health & Welfare and ICT graduates. ICT graduates have the highest average weekly earnings three years after graduating and continue to earn the highest after eight years (€977 per week). After eight years, undergraduates from Engineering, Manufacturing & Construction, Science, Mathematics & Statistics and Business, Administration & Law also have high average earnings of €926, €896 and €879 respectively per week. Eight years after graduating, Education undergraduates earn slightly below the average of all undergraduates earning €793 on average per week.

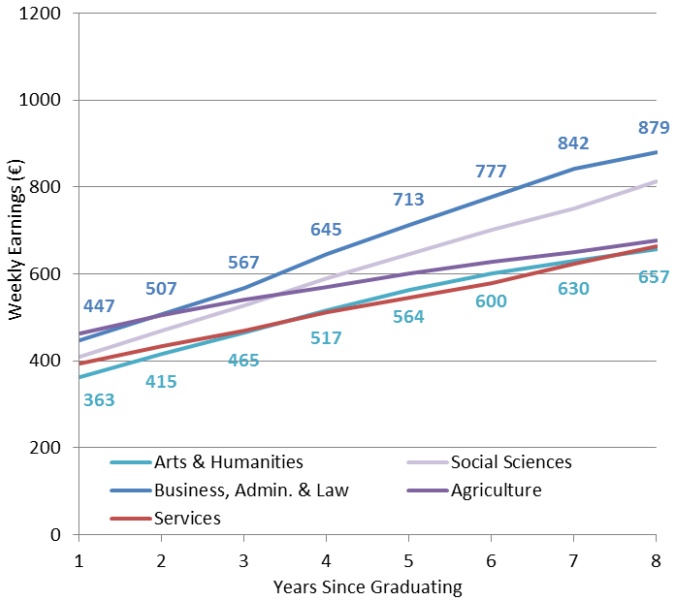
Arts & Humanities and Services undergraduates earn the lowest average weekly amounts of €363 and €394 respectively one year after graduating. These graduates, together with graduates from Agriculture, are the lowest paid on average after eight years, earning €657, €663 and €676, respectively, per week.

Figure 10: Undergraduates Average Weekly Earnings by Broad Field of Study (€)

A: Top Five (at 1 Year Since Graduation)



B: Bottom Five (at 1 Year Since Graduation)

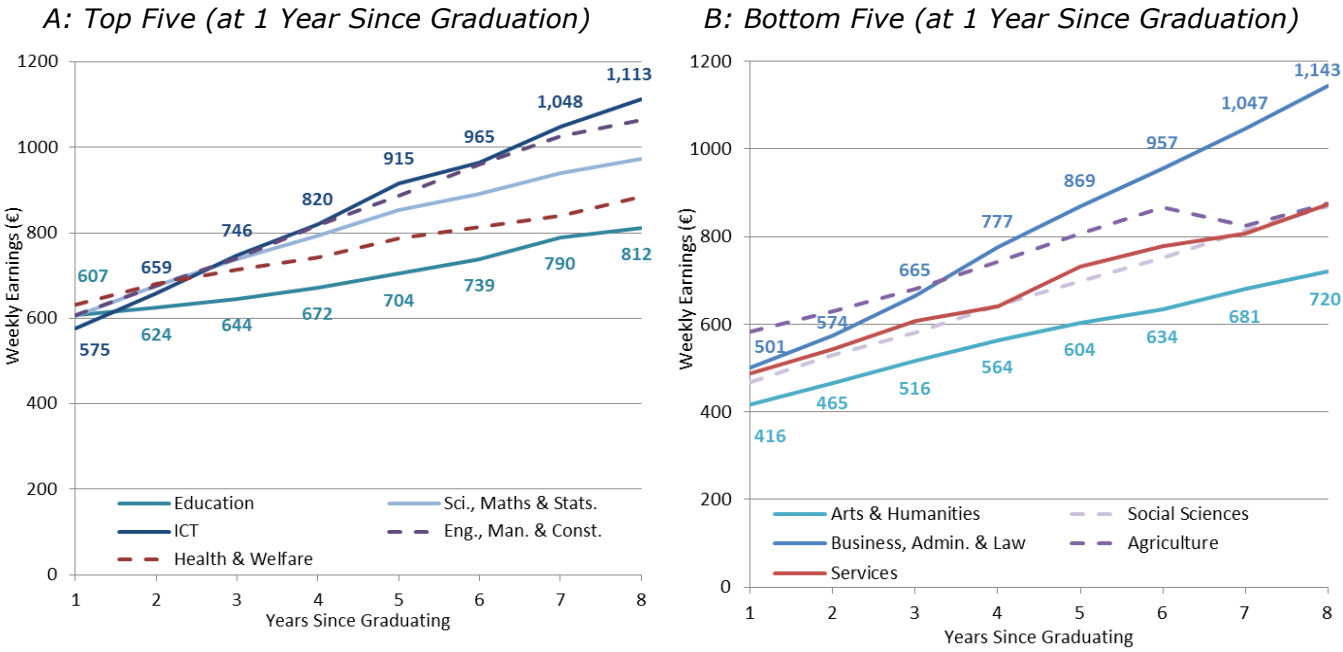


Note: Earnings are conditional on substantial employment and relate to real values in terms of 2016 consumer prices (using the headline Consumer Price Index). Calculations for each year since graduation are based on the respective sample in substantial employment in columns 2 – 9 of Table A.3.

Postgraduates in each field of study earn more compared to undergraduates and the earnings trajectory for postgraduates differs somewhat for some fields of study compared to undergraduates. Health & Welfare postgraduates earn the most on average after one year, earning €633 per week followed closely by Education, Engineering, Manufacturing & Construction and Science, Mathematics & Statistics postgraduates who earn around €607 on average per week.

Eight years after graduating, postgraduates from Business, Administration & Law earn the most (on average €1,143 per week). This is followed by ICT and Engineering, Manufacturing & Construction graduates who, respectively, on average earn €1,113 and €1,064 per week. Arts & Humanities postgraduates earn the lowest average weekly amount of €416 one year after graduating and remain the lowest paid after eight years earning €720 per week.

Figure 11: Postgraduates Average Weekly Earnings by Broad Field of Study (€)



Note: Earnings are conditional on substantial employment and relate to real values in terms of 2016 consumer prices (using the headline Consumer Price Index). There are a small number of postgraduates from Agriculture courses and comprise less than 50 observations after 5 years. Calculations for each year since graduation are based on the respective sample in substantial employment in columns 2 – 9 of Table A.4.

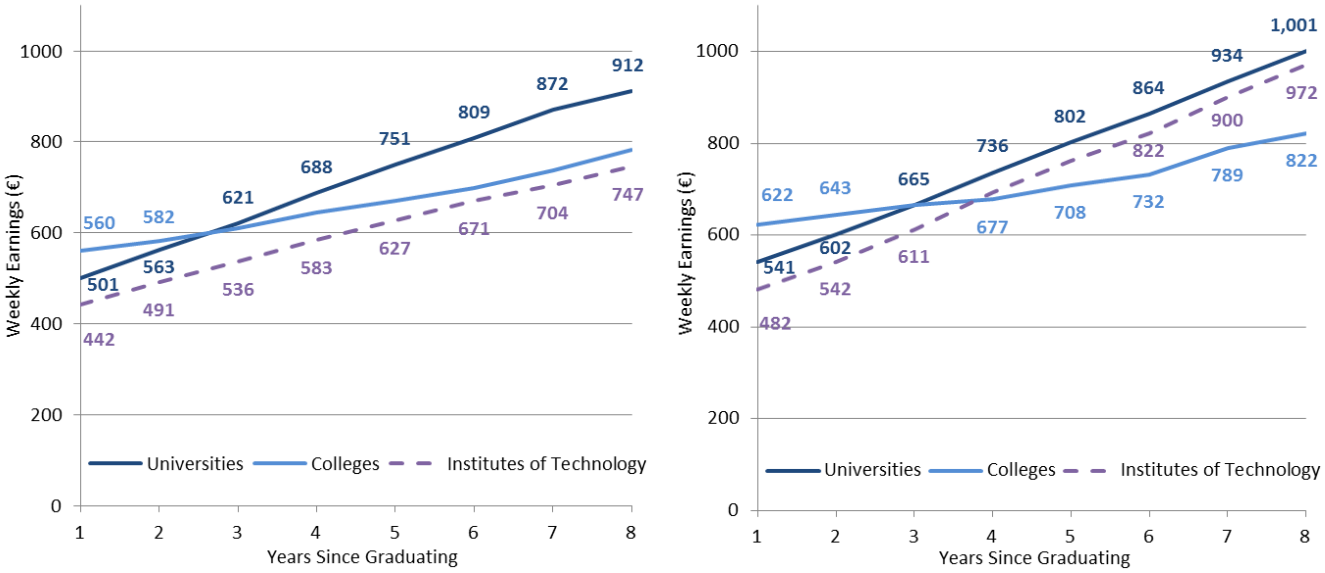
4.5.3 Average Earnings by Institution Type

Earnings are different for graduates across institution types for both undergraduates and postgraduates as shown in Figure 12. However, the average earnings shown below do not take into account the reality that graduates generally enter universities and colleges with higher Leaving Certificate points on average compared to institutes of technology. Also, earnings by institution type do not take into account the different subject mix offered by each institution type. For instance, colleges, with the exception of NCAD, primarily offer teacher training courses and only some universities offer medicine courses.

Both undergraduates and postgraduates from colleges earn the most one and two years after graduating, which reflects the concentration of teacher training courses offered by colleges. After four years, university undergraduates and postgraduates earn the most. After eight years, university undergraduates earn on average €912 per week compared to €747 for undergraduates from institutes of technology. This difference between universities and institutes of technology is narrower for postgraduates (€1,001 compared to €972, respectively).

Figure 12: Average Weekly Earnings by Institution Type (€)

A: Undergraduates *B: Postgraduates*



Note: Earnings are conditional on substantial employment and relate to real values in terms of 2016 consumer prices (using the headline Consumer Price Index). Calculations for each year since graduation are based on the respective sample in substantial employment in columns 2 – 9 of Table A.3 for undergraduates and Table A.4 for postgraduates. The institutions comprising each institution type is listed in Appendix B.

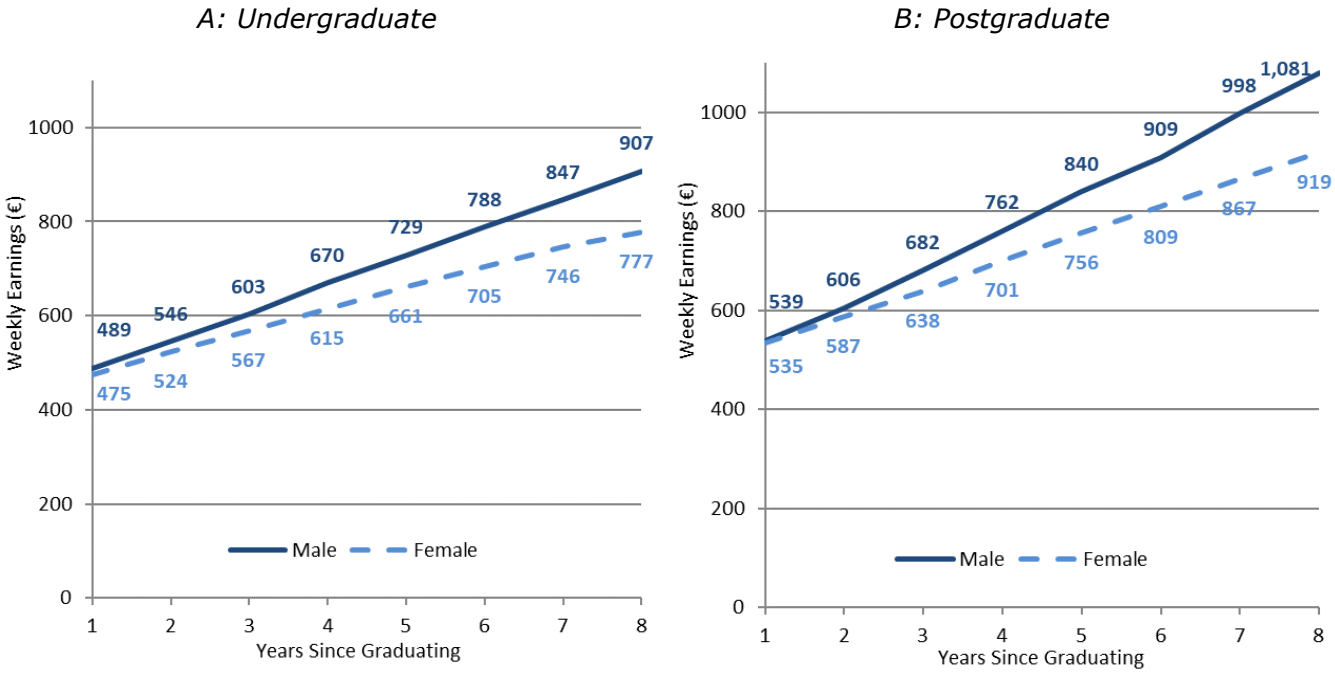
4.5.4 Average Earnings by Gender

Figure 13 shows that male graduates earn more than females on average and the difference grows over time. It is important to note however that the differences shown here are not adjusted for the different degree subjects that males and females choose to study and the variation in earnings across different subjects (as shown in Figure 1, Figure 10 and Figure 11). Regression analysis in Sections 5.5 and 6.2 attributes some of the gender gap in earnings to differences in subject and institution choices and other observed differences in male and female graduates.

For undergraduates one year after graduating, females earn €14 per week (or 3 percent) less on average than males but eight years after graduating, female undergraduates earn €130 (or 14 percent) less. This is lower than the difference between undergraduates in England where the gap is approximately 25 percent in average earnings seven years after graduating (Belfield et al., 2018).

For postgraduates, the difference in earnings by gender is initially smaller than for undergraduates but the difference grows faster over time. One year after graduating females earn on average €4 (or 1 percent) less per week than males but females earn €162 (or 15 percent) less after eight years.

Figure 13: Average Weekly Earnings by Gender (€)



Note: Earnings are conditional on substantial employment and relate to real values in terms of 2016 consumer prices (using the headline Consumer Price Index). Calculations for each year since graduation are based on the respective sample in substantial employment in columns 2 – 9 of Table A.3 for undergraduates and Table A.4 for postgraduates.

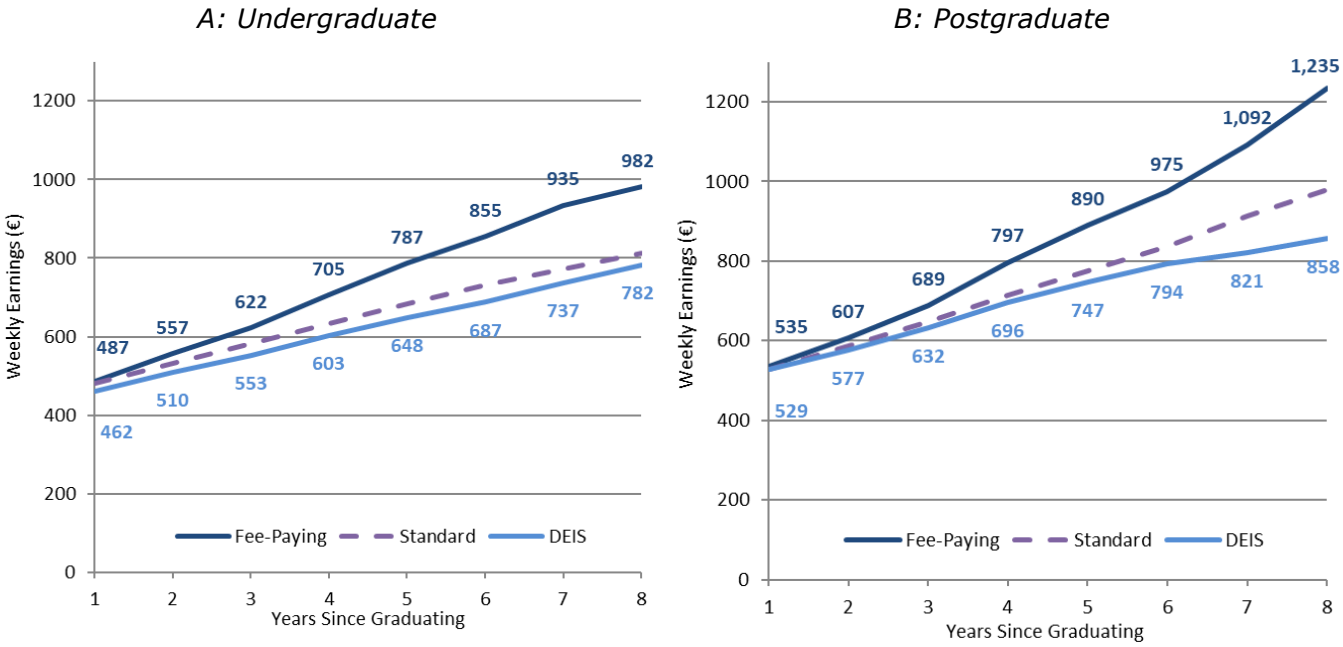
4.5.5 Average Earnings by Second-Level School Type

Figure 14 shows average weekly earnings for undergraduates and postgraduates by the type of second-level school they attended. It is important to note that the average earnings presented here are before any attempt is made to explain part of these overall differences with other relevant factors such as the different degree subjects individuals study (as shown in Figure 3).

One year after graduating, undergraduates who attended a fee-paying school earn €25 (or 5 percent) more per week on average than undergraduates who attended a DEIS school. After eight years, the difference between undergraduates who attended a fee-paying school compared to a DEIS school is on average €200 per week or 26 percent.

The difference is smaller for postgraduates who attended a fee-paying school compared to a DEIS school one year after graduating (€6 or 1 percent). However, after eight years, postgraduates who attended a fee-paying school compared to a DEIS school earn €377 more on average per week (or 44 percent).

Figure 14: Average Weekly Earnings by Second-Level School Type (€)



Note: Earnings are conditional on substantial employment and relate to real values in terms of 2016 consumer prices (using the headline Consumer Price Index). Calculations for each year since graduation are based on the respective sample in substantial employment in columns 2 – 9 of Table A.3 for undergraduates and Table A.4 for postgraduates.

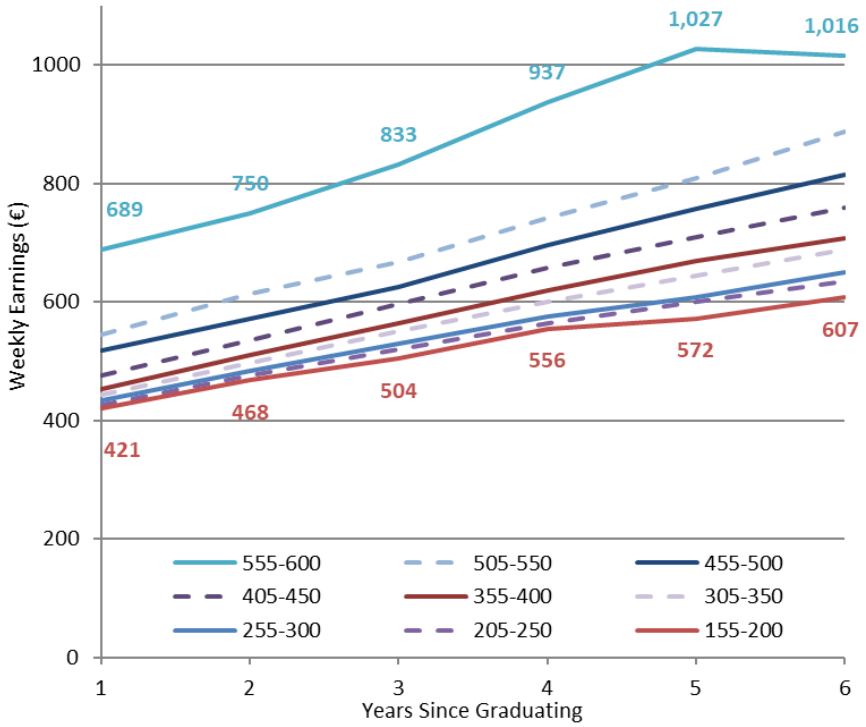
4.5.6 Average Earnings by Leaving Certificate Points

Leaving Certificate points are a measure of academic attainment prior to entering higher education. Given that admission to undergraduate degree programmes is largely driven by points achieved in the Leaving Certificate it is important to take into account prior achievement when examining earnings. For example, Section 4.4 shows how Leaving Certificate points vary across field of study, gender, institution type and second-level school type for undergraduates and earnings has been shown to vary by these characteristics.[22]

It is clear from Figure 15 that undergraduates who achieved higher Leaving Certificate points earn increasingly more in each year after graduating. Undergraduates who achieved the highest points range, between 555 and 600 points, earn considerably more compared to other graduates while the difference in earnings is minimal between graduates achieving lower ranges of points. Graduates who achieved 555 to 600 points earn €268 per week (or 64 percent) more after one year compared to graduates who achieved 155 to 200 points and the difference is €409 (or 67 percent) after six years. However, the difference in average earnings between graduates achieving 155-200 and 205-250 points is just €6 per week (or 1 percent) after one year and €28 (or 5 percent) after six years.

[22] Analysis of points is restricted to graduates of undergraduate programmes only as the information is obtained from an individuals' record upon first registering in higher education and this coverage is limited for postgraduates, as detailed in Section 3.1.

Figure 15: Undergraduate Average Weekly Earnings by Leaving Certificate Points Range (€)



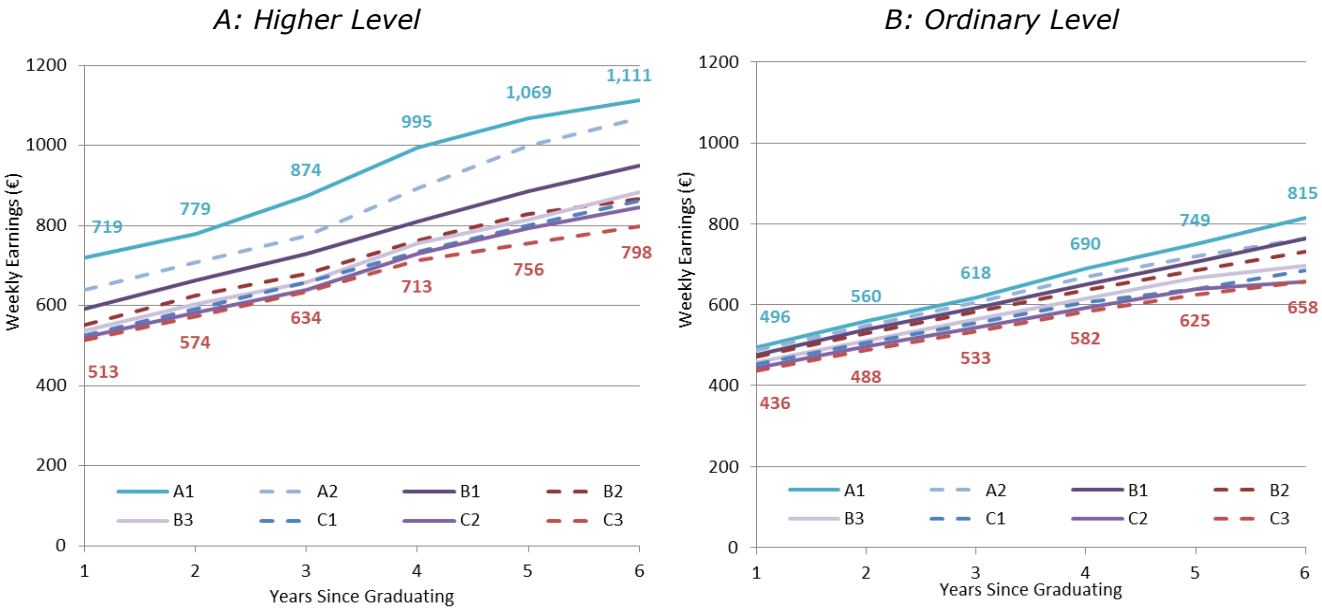
Note: Earnings are conditional on substantial employment and relate to real values in terms of 2016 consumer prices (using the headline Consumer Price Index). Calculations for each year since graduation are based on the respective sample of undergraduates in substantial employment in columns 2 – 7 of Table A.3 (for graduation cohorts from 2012 to 2017).

4.5.7 Average Earnings by Leaving Certificate Mathematics Grades

Earnings by Leaving Certificate Mathematics grades closely mirror earnings by Leaving Certificate points. In a similar vein to Leaving Certificate points, Mathematics grades are a measure of prior academic attainment and analysis is restricted to graduates of undergraduate programmes only. D grades and a fail grade are not shown due to small sample sizes. Mathematics grades are split into separate figures for Higher and Ordinary Levels.

Graduates who achieved a Higher Level C3 earned more an average compared to graduates with an Ordinary Level A1 in all years after graduating, except the last. The difference in earnings between graduates who achieved a Higher Level A1 and C3 is larger (40 percent after one year and 39 percent after eight years) than for graduates achieving an Ordinary Level A1 and C3 (14 percent after one year and 24 percent after eight years).

Figure 16: Undergraduate Average Weekly Earnings by Leaving Certificate Mathematics Grades (€)



Note: The old grading system for Mathematics is used because the higher education graduates analysed in this report sat the Leaving Certificate prior to the new grading scheme which was introduced in 2017. Earnings are conditional on substantial employment and relate to real values in terms of 2016 consumer prices (using the headline Consumer Price Index). Calculations for each year since graduation are based on the respective sample of undergraduates in substantial employment in columns 2 – 7 of Table A.3 (for graduation cohorts from 2012 to 2017).

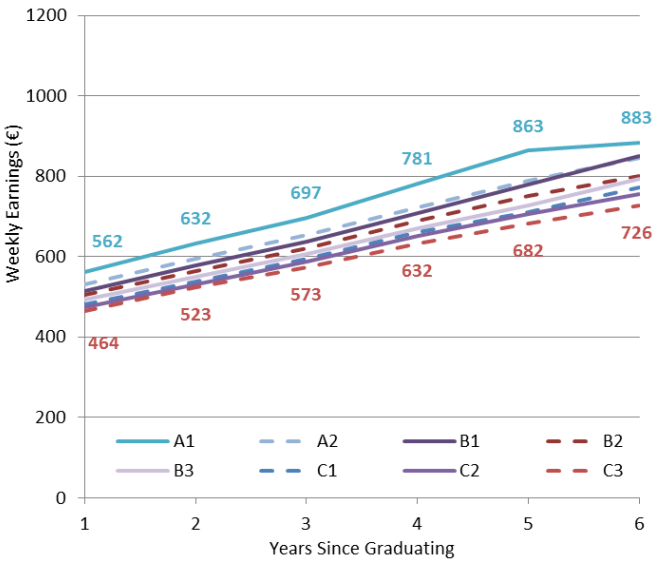
4.5.8 Average Earnings by Leaving Certificate English Grades

Earnings by Leaving Certificate English grades are shown for undergraduates in Figure 17. Graduates who achieved an Ordinary Level A1 earned more on average compared to graduates with a Higher Level C3 in all years after graduating, which contrasts the case for Mathematics grades.

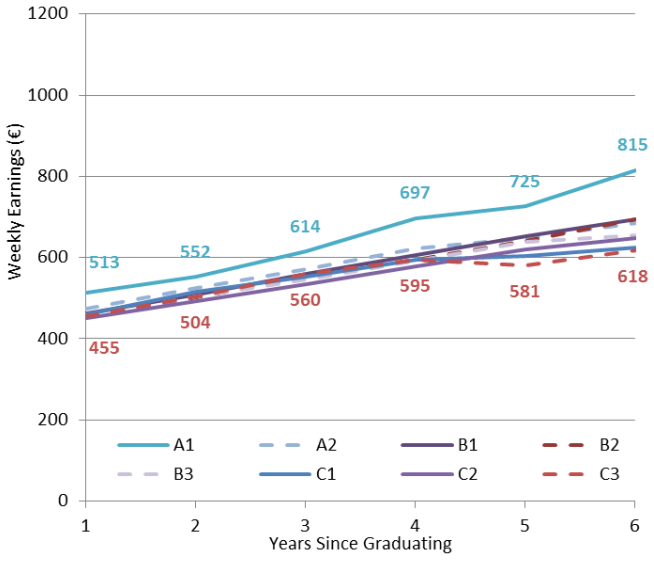
There is less variation in earnings for different English grades compared to Mathematics grades. For example, graduates who achieved a Higher Level A1 in English compared to graduates with an Ordinary Level A1 earn 10 percent more after one year and 8 percent more after six years. For Mathematics, these differences are 45 percent after one year and 36 percent after six years.

Figure 17: Undergraduate Average Weekly Earnings by Leaving Certificate English Grades (€)

A: Higher Level



B: Ordinary Level



Note: The old grading system for English is used because the higher education graduates analysed in this report sat the Leaving Certificate prior to the new grading scheme which was introduced in 2017. Earnings are conditional on substantial employment and relate to real values in terms of 2016 consumer prices (using the headline Consumer Price Index). Calculations for each year since graduation are based on the respective sample of undergraduates in substantial employment in columns 2 – 7 of Table A.3 (for graduation cohorts from 2012 to 2017).

5 Regression Analysis Four Years After Graduation

5.1 Introduction

As outlined above, this report focuses on analysing graduates' earnings by degree subject, institution type, gender and socio-economic background. This section presents the results of regression analysis that models graduate earnings by taking into consideration all of the characteristics of graduates that determine wages.

For instance, the choice of what to study is influenced by prior academic ability, socio-economic background and gender (as shown in Figure 5, Figure 3 and Figure 1 respectively). In turn, these characteristics also determine graduates' earnings (as shown in Figure 15, Figure 16, Figure 17, Figure 14 and Figure 13) which may confound the impact of degree subject choice on graduates' earnings. This section attempts to compare like-for-like graduates to isolate the impact of degree subject, institution type, gender and socio-economic background on graduates' earnings.

5.2 Regression Methodology

In keeping with most of the academic literature, the causal impact of degree subject, institution type, gender and socio-economic background on earnings cannot be determined without experimental data. The causal impact of higher education on earnings is masked by a student's innate ability, which may also drive their choice of degree subject and institution. For example, a student with exceptional ability may earn high wages, irrespective of their education level, but typically they are more likely to study a degree programme in an institution with high earnings potential.

While a student's ability is not readily observable, prior academic attainment in terms of Leaving Certificate points, Mathematics and English grades are observed in the HEA's new entrant records and these can be used as a proxy for ability. This allows the analysis to separately identify the earnings impact of degree subject from prior academic attainment.

In essence, the analysis employs richly specified regression models to estimate how graduates' earnings vary amongst similarly qualified individuals. Graduates' earnings four years after graduation are measured as a function of graduation cohort, institution, subject, demographic characteristics, prior academic attainment, socio-economic controls, an indicator for motherhood and sector of employment. There are four characteristics of interest:

- Field of study
- Institution type
- Gender
- Second-level school type

The effect of socio-economic background is measured using the type of second-level school that graduates previously attended because it is observed for both undergraduates and postgraduates (as detailed in Section 3.1). The analysis also captures the effects of socio-economic background using a deprivation index score of the schools' Electoral Division. This is because a disadvantaged school may not necessarily be located in a disadvantaged area. Students' socio-economic group is also captured though it is only observed for undergraduates as it comes from their new entrant record. [23]

In the field of study regressions, the sector of employment is excluded from the full model as it is an outcome from studying a particular subject at higher education.[24] Regressions for institution type include a control for detailed ISCED field of study rather than each course because there is limited overlap of courses with the same names across institutions. Gender and school type models include controls for each individual's course of study to facilitate comparisons of male and female graduates from the same course and to compare graduates from the same course who previously attended different types of school.

Specifically, ordinary least squares regression models of the relationship between graduates' characteristics and their earnings are estimated. The dependant variable in all models is the log of weekly earnings as the log transformation reduces the impact of outliers and yields residuals more closely resembling normal. All regressions are weighted to adjust for missing values of CSOPPSN by institution, award type and graduation cohort.[25]

Average predicted earnings four years after graduation are shown separately for undergraduates and postgraduates by subject, institution type, gender and second-level school type. Two predictions are shown. The 'Raw' prediction shows the raw correlation between earnings and the student characteristic of interest.[26] This represents the average

[23] There may nevertheless be other factors relating to social disadvantage that may cause earnings differences among graduates that cannot be accounted for here such as parental education or health status.
[24] For instance, previous analysis by the CSO (2018) show that 91 percent of 2010 Education graduates were employed in the education sector after five years and 65 percent of Health & Welfare graduates were employed in the health & social work sector.
[25] Full description of the weighting method is given in Appendix D: Graduates with Missing PPSN.
[26] The only other characteristic included is the graduation cohort the student graduates from.

prediction of graduate earnings before any attempt is made to explain part of the variation in wages.

The 'Model' prediction takes into account the full set of student characteristics described in Section 3.3, meaning that comparisons are made being made for like-for-like graduates. That is, comparisons are being made between graduates who studied the same subject in the same institution, received the same grade, are the same gender, from the same county, attended the same type of secondary school, work in the same sector and can account for the effect of having children on female earnings. For undergraduates, comparisons are also made between graduates who entered higher education at the same age, had the same performance in the Leaving Certificate and are in the same socio-economic group.

Note that predictions of undergraduate and postgraduate earnings are not directly comparable, despite often being presented side-by-side, as postgraduate regressions do not include controls for graduates' prior academic attainment, age at entry to higher education and socio-economic background. As detailed in Section 3.1, this information comes from a student's new entrant record, when they first register in higher education, and sufficient time does not elapse to link this information to their postgraduate qualification.

Furthermore, undergraduate models are estimated for pooled 2012, 2013 and 2014 graduation cohorts when such background information can be translated to their graduation record. The number of observations in undergraduate models is 34,788. Postgraduate models are estimated for more graduation cohorts, pooled from 2010 to 2014, as these models are not constrained by the availability of such background information. The number of observations in postgraduate models is 16,731.

5.3 Graduates' Predicted Earnings by Subject

Entry to the majority of places on courses are based on prior academic performance so, graduate characteristics will vary across fields of study. For instance, Sections 4.2.1, 4.3.1 and 4.4.1 show how field of study varies respectively by gender, second-level school type and Leaving Certificate points. Differences between the raw and model predictions indicate that part of the variation in earnings across different subjects can be, at least partially, explained by different types of graduates from each subject.

5.3.1 *Undergraduates' Predicted Earnings by Subject*

Predicted earnings are shown in Figure 18 for undergraduate fields of study four years after graduation (for pooled graduation cohorts 2012, 2013 and 2014). Both the raw and model predictions are shown, and subjects are sorted by the model prediction. The average number of individuals in each field of study is 512 and ranges from around 100 for some subjects (110 in Physics, 101 in Occupational Health and Safety and 97 in Statistics) to over 1,000 in others. Average predicted earnings from the model for undergraduate cohorts 2012, 2013 and 2014, four years after graduating, are €658 per week.

Medicine is the highest earning subject for undergraduates four years after graduating with graduates on average predicted to earn €1,235 per week in raw terms (keeping only the graduation cohort the same). However, when comparing like-for-like graduates in the model prediction, average predicted earnings for Medicine graduates are €1,085 per week.[27] The difference between the raw and model predictions likely arises from the fact that Medicine graduates tend to enter higher education with higher prior academic achievements (as shown in Figure 5) and come from more advantaged socio-economic backgrounds (as shown in Figure 3). This is also apparent for Statistics graduates who, in raw terms, are predicted to earn on average €1,158 per week compared to €925 per week when like-for-like graduates are compared. Other high earning subjects, when comparing otherwise similar graduates, include Chemical Engineering & Processes (€853), Medical Diagnostic & Treatment Technology (€830) and Other ICT courses (€802).

Graduates from the Arts & Humanities field of study make up six out of the ten lowest earning subjects, broadly reflecting the previous descriptive analysis in Figure 10. The highest earning area within the Arts & Humanities field of study is Interdisciplinary Arts & Humanities programmes. This may be because courses within this subject are often combined with subjects outside of Arts & Humanities. Other relatively low earning subjects, when comparing otherwise similar graduates, include Pre-school Teacher Training & Other Education, Psychology, Political Sciences & Civics and Child Care & Youth Services.

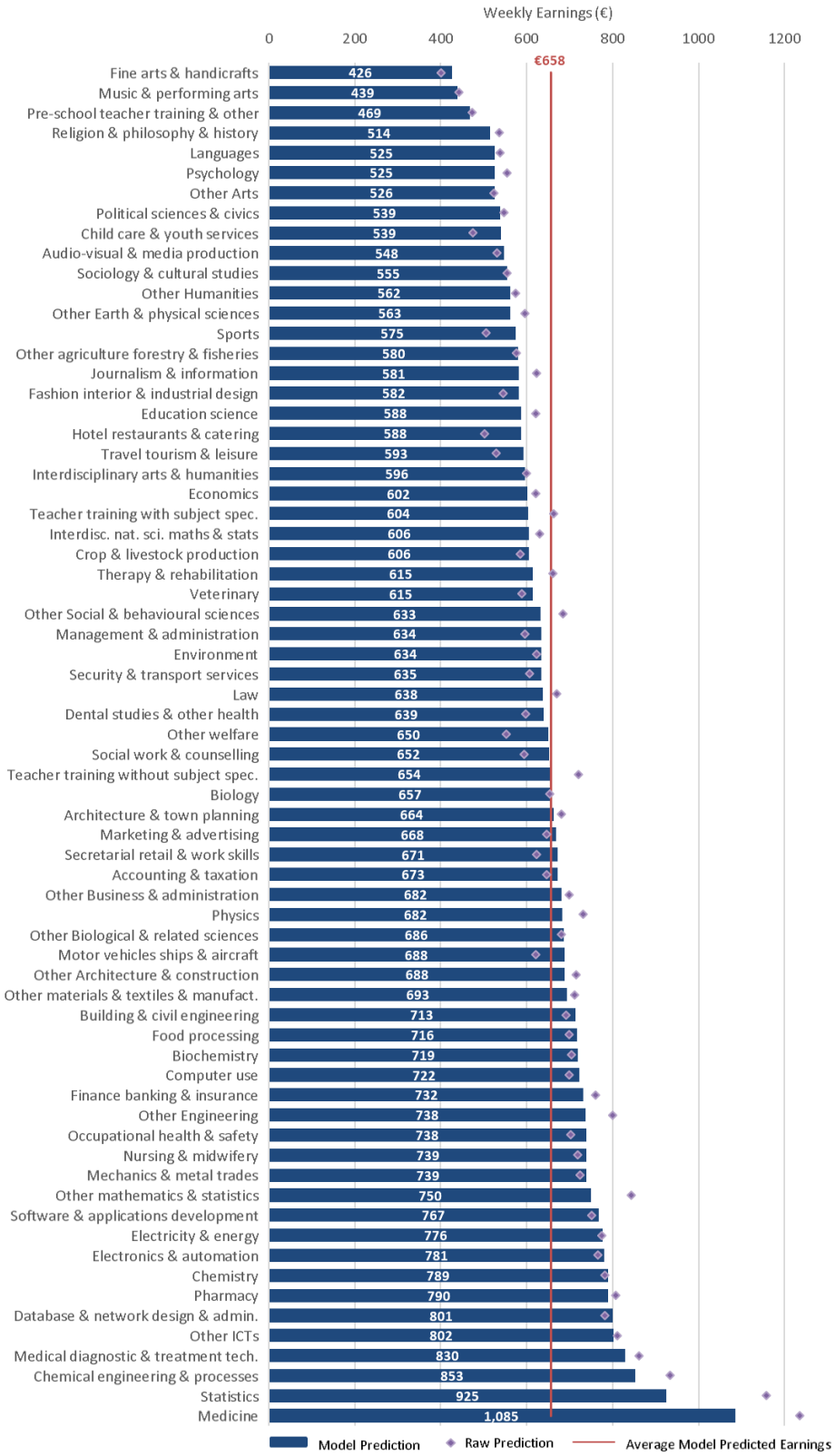
Analysing field of study at such a detailed level affords the possibility of comparing the earnings of individual subjects that comprise the broader fields of study. For instance, descriptive statistics in Figure 10 shows that undergraduates within the Services field of study have relatively low average weekly earnings four years after graduating. However,

[27] The model prediction can also be thought of as the expected earnings from studying Medicine if every student were to graduate from Medicine.

detailed analysis shows that Occupational Health & Safety graduates earn more than average. Within the broader Health & Welfare field of study, Medicine, Medical Diagnostic & Treatment Technology, Pharmacy and Nursing & Midwifery graduates earn considerably more than graduates on average four years after graduation. Graduates from Social Work & Counselling, Other Welfare, Therapy & Rehabilitation and Dental Studies & Other Health earn close to average graduates while Child Care & Youth Services earn below average graduates, when like-for-like graduates are compared.

While the descriptive statistics in Figure 10 show that ICT undergraduates earn the highest average amount per week four years after graduating, analysing field of study at a more disaggregated level reveals that graduates from Other ICT courses earn the 6th highest overall in terms of raw predicted earnings and the 5th highest in terms of predicted model earnings. Graduates from Database & Network Design & Administration earn 10th highest in terms of raw predicted earnings and 6th in terms of predicted model earnings. Graduates from Software & Applications Development and Computer Use earn 11th and 18th highest overall in terms of predicted model earnings.

Figure 18: Undergraduates' Predicted Earnings 4 Years after Graduation by Subject (€)



Note: Predicted earnings are conditional on graduates being in substantial employment. The number of observations is 34,788. The 'Raw Prediction' is the predicted earnings from the model containing indicators for only the graduation cohort and subject. The 'Model Prediction' includes additional controls for institution, award type, final degree grade, gender, county of origin, age at entry to higher education, LC points, LC Maths and English grades, second-level school type, deprivation index score of schools' Electoral Division, socio-economic group and an indicator for motherhood. Detailed regression results are shown in Table E.1.

5.3.2 *Postgraduates' Predicted Earnings by Subject*

Figure 19 presents predicted earnings four years after graduation (for pooled graduation cohorts 2010 to 2014) by detailed ISCED field of study for postgraduates. Both the raw and model predictions are shown and subjects are sorted by the model prediction. Estimates have been supressed for fields of study comprising fewer than 95 individuals to increase confidence that the predictions are not the result of sample variability. Excluding these, the average number of individuals in each field of study is 415 and ranges from around 100 for some subjects (99 in Physics and 103 in Other Humanities) to over 1,000 in others. The average model predicted earnings for postgraduate cohorts 2010, 2011, 2012, 2013 and 2014, four years after graduating, are €733 per week.

In terms of raw earnings, postgraduates from Physics earn the highest weekly earnings, four years after graduating, with graduates on average predicted to earn €963 per week (keeping only the graduation cohort the same). However, when like-for-like graduates are compared, the average predicted earnings for physics postgraduates falls considerably to €779 per week. This implies that a large share of earnings can be explained by other characteristics that determine wages, such as the fact that the majority of Physics postgraduates graduate with a PhD. Similar proportions in predicted earnings can also be explained for postgraduates from Other Engineering and Chemistry.

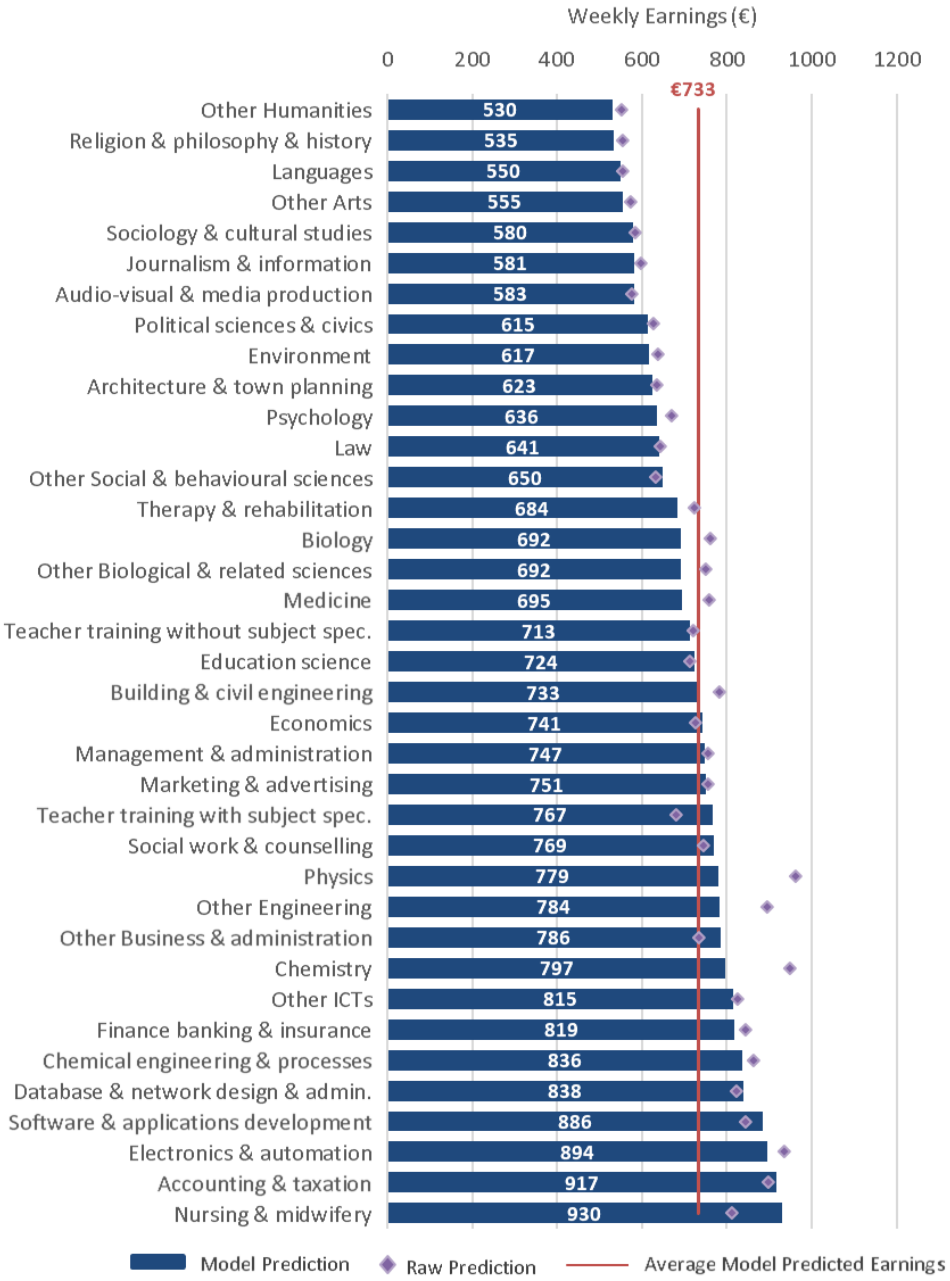
When comparing postgraduates with the same characteristics (such as institution, degree, demographic characteristics, socio-economic background, parental information and employment characteristics), Nursing & Midwifery graduates earn the most with graduates predicted to earn on average €930 per week. Other high earning subjects, when comparing like-for-like graduates, include Accounting & Taxation (€917), Electronics & Automation (€894) and Software & Applications Development (€886).

It is interesting to note that the model prediction for Nursing & Midwifery is substantially higher than the average predicted raw earnings of €811 per week. This suggests that a large share of earnings can be explained by other characteristics that determine earnings, such as the fact that the vast majority of Nursing & Midwifery postgraduates graduate with a Postgraduate Diploma or Certificate.

Differences in student characteristics account for little of the variation in predicted earnings for postgraduate courses that earn well below the average. Postgraduates from the Arts & Humanities field of study make up four of the five lowest earning subjects (with sufficient sample size) which reflect the previous results for undergraduates.

Postgraduates from Medicine earn below the average, in terms of predicted earnings, and earn considerably less than undergraduates from Medicine. Postgraduates from Medicine study a much broader range of courses compared to undergraduates with half graduating from Masters level courses in Public Health, Regenerative Medicine, Medical Physics, Neuroscience, Molecular Medicine and a PhD in Transnational Medicine. The other half graduated from over thirty different courses.

Figure 19: Postgraduates' Predicted Earnings 4 Years after Graduation by Subject (€)



Note: Predicted earnings are conditional on graduates being in substantial employment. The number of observations is 16,731. The 'Raw Prediction' is the predicted earnings from the model containing indicators for only the graduation cohort and subject. The 'Model Prediction' includes additional controls for institution, award type, final degree grade, gender, county of origin, second-level school type, deprivation index score of schools' Electoral Division and an indicator for motherhood. Detailed regression results are shown in Table E.2.

5.4 Graduates' Predicted Earnings by Institution Type

Entry requirements vary across courses and institutions therefore, graduate characteristics will vary across different types of institutions. For instance, Sections 4.2.2, 4.3.2 and 4.4.2 shows how gender, second-level school type and Leaving Certificate points, respectively, vary across different institution types. Differences between the raw and model predictions indicate that part of the variation in earnings across institution types can be, at least partially, explained by different subject mixes and different student populations in each type of institution.

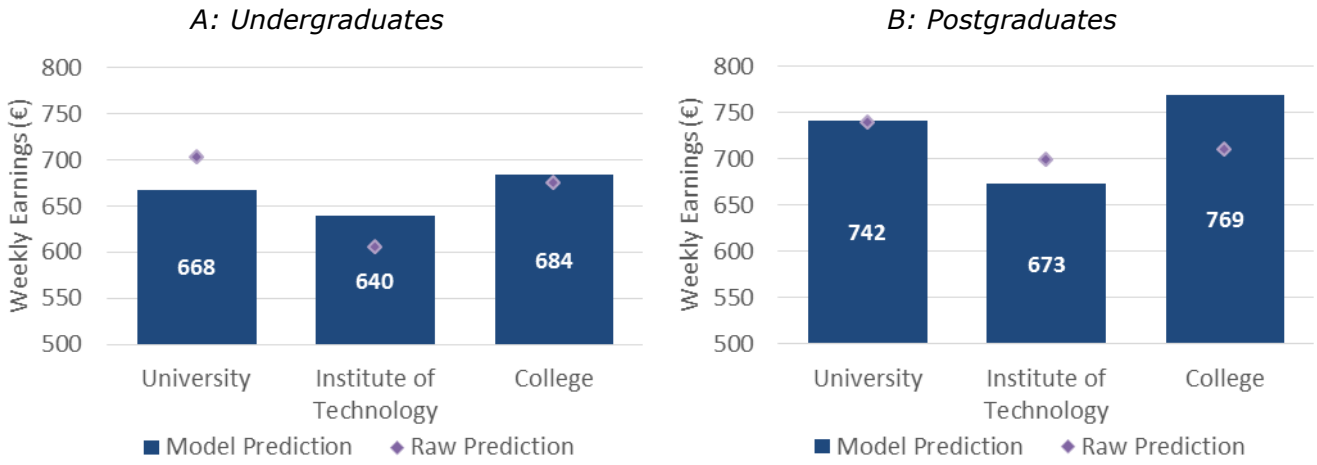
Figure 20 presents the average raw and model predictions of earnings by institution type for both undergraduates and postgraduates. In raw terms, undergraduates from institutes of technology earn 14 percent less on average compared to university graduates while postgraduates earn 6 percent less. These raw differences correspond closely to the differences reported with the descriptive statistics in Section 4.5 of average earnings by institution type, four years after graduating.[28]

When the differences in student characteristics are controlled for in the model predictions, the difference in average predicted earnings between institute of technology and university undergraduates is reduced considerably to 4 percent. This is likely attributable to differences in prior academic achievement as institutions are academically selective and universities typically have higher entry requirements. The difference for postgraduates increases to 9 percent which may be partly due to the inability to control for prior academic achievement for this cohort.

The difference in raw average predicted earnings for college and university graduates are relatively small. Both undergraduates and postgraduates from colleges earn 4 percent less than university graduates. However, once differences in graduate characteristics are taken into account, the difference in earnings is reversed. Undergraduates and postgraduates from colleges earn 2 percent and 4 percent more respectively than university graduates.

[28] Note however, that the average raw prediction is not directly comparable to Figure 12 in Section 4.5 as the descriptive statistics are simple averages calculated using all available graduation cohorts from 2010 while the predicted earnings are model-based estimates of log-earnings (transformed back into levels) and the undergraduate models only use graduation cohorts from 2012 (when new entrant information becomes available).

Figure 20: Graduates' Predicted Earnings 4 Years after Graduation by Institution Type (€)



Note: Predicted earnings are conditional on graduates being in substantial employment. The numbers of undergraduate and postgraduate observations are 34,788 and 16,731, respectively. The 'Raw Prediction' is the predicted earnings from the model containing indicators for only the graduation cohort and institution type. The 'Model Prediction' for undergraduates includes additional controls for subject, award type, final degree grade, gender, county of origin, age at entry to higher education, LC points, LC Maths and English grades, second-level school type, deprivation index score of schools' Electoral Division, socio-economic group, an indicator for motherhood and sector of employment. The 'Model Prediction' for postgraduates excludes characteristics relating to a graduate's new entrant information which are their age at entry to higher education, LC points, LC Maths and English grades and socio-economic group. Detailed regression results are shown in Tables E.3 and E.4.

5.5 Graduates' Predicted Earnings by Gender

Figure 21 presents the average raw and model predictions of earnings by gender for both undergraduates and postgraduates. In raw terms, average predicted earnings for female undergraduates are €61 per week less (or 9 percent) compared to males four years after graduating while female postgraduates earn €58 less per week (or 8 percent). These raw differences in average predicted earnings correspond closely to the descriptive statistics of average earnings by gender, four years after graduating reported in Section 4.5.[29]

The purpose of modelling graduate earnings by gender is to attempt to explain some of this variation with the characteristics of male and female graduates. When these differences in course choices and student characteristics are controlled for in the model prediction, the difference in average predicted earnings is reduced considerably to €20 (or 3 percent) for undergraduates and €5 (or less than 1 percent) for postgraduates.

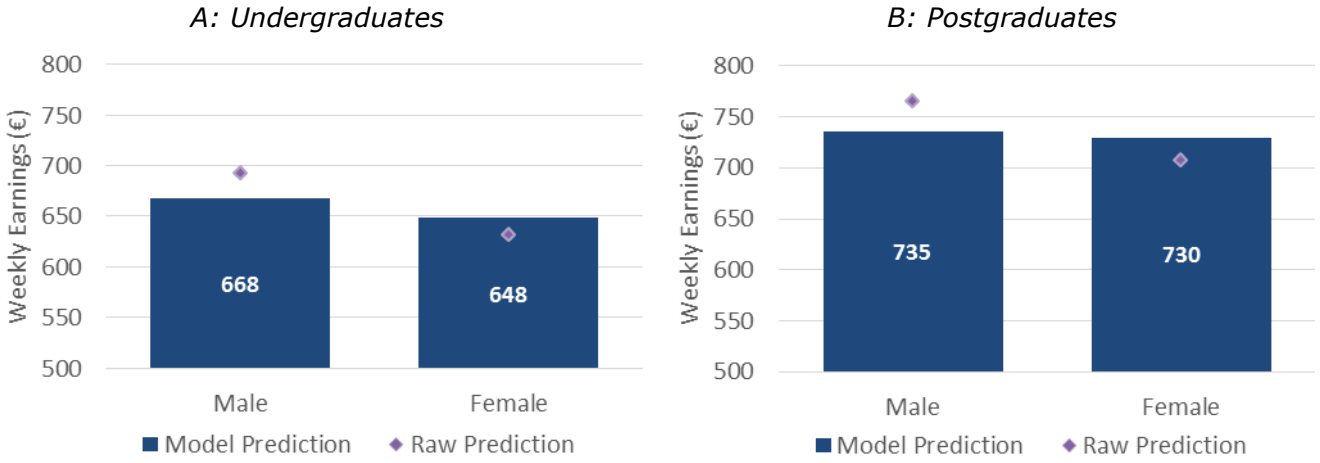
It is clear that other student characteristics explain some, but necessarily all, of the differences in weekly earnings between male and female graduates. Four years after graduation, a statistically significant gap of 3 percent exists in weekly earnings for

[29] Note however, that the average raw prediction is not directly comparable to Figure 13 in Section 4.5 as the descriptive statistics are simple averages calculated using all available graduation cohorts from 2010 while the predicted earnings are model-based estimates of log-earnings (transformed back into levels) and the undergraduate models only use graduation cohorts from 2012 (when new entrant information becomes available).

undergraduate males and females who graduated from the same course, had the same degree characteristics, the same prior academic attainment, the same demographic and socio-economic background, were working in the same sector and accounting for the fact that some females have children. The pay gap of less than 1 percent in weekly earnings for postgraduates is not statistically significant meaning that these characteristics can effectively explain the gender pay gap for postgraduates. Detailed results (in Tables E.5 and E.6) show that course and institution choice explain most of the raw differences in earnings by gender.

It is also worth reiterating that while the indicator for motherhood in the model partly explains some of the differences in earnings it may also partially capture part-time employment amongst females as hours worked are not observed in the data. While weekly earnings provide essential information about economic well-being, hourly wage data would provide a more appropriate basis for comparing the labour market returns among different groups as hours of work may vary by gender and parental status. Also, the administrative data cannot account for gender differences in graduates' specific occupation which may explain part of the remaining variation in earnings by gender.

Figure 21: Graduates' Predicted Earnings 4 Years after Graduation by Gender (€)



Note: Predicted earnings are conditional on graduates being in substantial employment. The numbers of undergraduate and postgraduate observations are 34,788 and 16,731 respectively. The 'Raw Prediction' is the predicted earnings from the model containing indicators for only the graduation cohort and gender. The 'Model Prediction' for undergraduates includes additional controls for course name, institution, award type, final degree grade, county of origin, age at entry to higher education, LC points, LC Maths and English grades, second-level school type, deprivation index score of schools' Electoral Division, socio-economic group, an indicator for motherhood and sector of employment. The 'Model Prediction' for postgraduates excludes characteristics relating to a graduate's new entrant information which are their age at entry to higher education, LC points, LC Maths and English grades and socio-economic group. Detailed regression results are shown in Tables E.5 and E.6.

5.6 Graduates' Predicted Earnings by Second-Level School Type

The average raw and model predictions of both undergraduate and postgraduate earnings by second-level school type are shown in Figure 22. The type of second-level school attended matters in terms of the raw average earnings prediction. Undergraduates who previously attended a fee-paying school compared to a standard school earn €61 per week (or 9 percent) more four years after graduating in terms of raw average predicted earnings. The raw difference is €81 per week (or 11 percent) for postgraduates. These raw differences in average predicted earnings are consistent with the descriptive statistics presented in Section 4.5.[30]

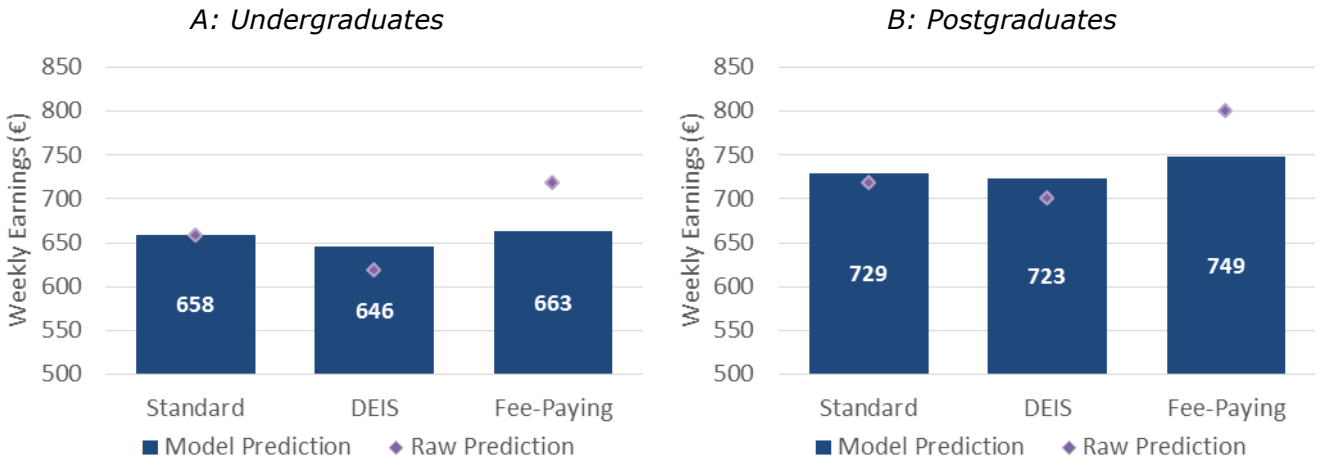
However, controlling for the course studied and other characteristics makes a considerable difference in the predicted earnings for graduates who previously attended a fee-paying school. When these differences are taken into account in the model prediction, the difference in average predicted earnings is reduced considerably to a non-significant difference (€5 per week or less than 1 percent) for undergraduates and €20 per week (or 3 percent) for postgraduates.

In raw terms, undergraduates who previously attended a DEIS school earn €39 per week (or 6 percent) less than their peers who attended standard schools in terms of average predicted earnings. The raw difference is €18 per week (or 3 percent) for postgraduates. However, much of this difference can be explained by differences in what graduates study and other characteristics. When these differences are taken into account in the model prediction, the difference in average predicted earnings is reduced considerably to €12 per week (or 2 percent) for undergraduates and a non-significant difference of €6 per week (or 1 percent) for postgraduates.

Together these results show that differences in graduate characteristics and their choice of institution and course effectively explains the variation in earnings for undergraduates who attended fee-paying schools compared to standard schools. For postgraduates who attended DEIS schools, the difference in earnings compared to those who attended standard schools can be effectively explained by course and institution choices and other graduate characteristics. In all instances, institution and course choices explain most of the raw differences in earnings by graduates who attended different types of school (as shown in detailed results in Tables E.7 and E.8).

[30] Note however, that the average raw prediction is not directly comparable to Figure 14 in Section 4.5 as the descriptive statistics are simple averages calculated using all available graduation cohorts from 2010 while the predicted earnings are model-based estimates of log-earnings (transformed back into levels) and the undergraduate models only use graduation cohorts from 2012 (when new entrant information becomes available).

Figure 22: Graduates' Predicted Earnings 4 Years after Graduation by Second-Level School Type (€)



Note: Predicted earnings are conditional on graduates being in substantial employment. The numbers of undergraduate and postgraduate observations are, respectively, 34,788 and 16,731. The 'Raw Prediction' is the predicted earnings from the model containing indicators for only the graduation cohort and school type. The 'Model Prediction' for undergraduates includes additional controls for course name, institution, award type, final degree grade, gender, county of origin, age at entry to higher education, LC points, LC Maths and English grades, deprivation index score of schools' Electoral Division, socio-economic group, an indicator for motherhood and sector of employment. The 'Model Prediction' for postgraduates excludes characteristics relating to a graduate's new entrant information which are their age at entry to higher education, LC points, LC Maths and English grades and socio-economic group. Detailed regression results are shown in Tables E.7 and E.8.

6 Regression Analysis Over Time for Gender and Second-Level School Type

6.1 Introduction

This section expands upon the regression analysis in the previous section by analysing how graduates' earnings vary by gender and second-level school type over a longer time period. Earnings are modelled using the same set of characteristics used for the model predictions in the previous section.

Three models are estimated for undergraduates. The first is equivalent to the raw prediction in the previous section where the only control is the graduation cohort and it is estimated for graduation cohorts from 2010. The second is equivalent to the model prediction in the previous section. That is, undergraduate earnings are measured as a function of graduation cohort, institution attended, course studied, degree characteristics, demographic background, prior academic attainment, socio-economic background, motherhood and sector of employment. This model is only estimated for graduation cohorts from 2012. The third model excludes information from a student's new entrant record (on prior academic attainment, age at entry to higher education and socio-economic group) and is estimated for graduation cohorts from 2010. Excluding this information facilitates analysis of undergraduate earnings for a longer time period (for 7 and 8 years after graduating).

For postgraduates, sufficient time does not elapse to link their new entrant information to their postgraduate qualification as explained in Section 3.1. Therefore, only two models are estimated, using graduation cohorts from 2010, which are equivalent to those estimated in the previous section. The raw difference only controls for the graduation cohort. The full model includes controls for graduation cohort, institution attended, course studied, degree characteristics, demographic background, socio-economic background, motherhood and sector of employment. Controls for graduates' prior academic attainment, age at entry to higher education and socio-economic group are excluded.

These models are estimated separately for each year after graduation using cross-sectional OLS regressions. The raw differences can be thought of as the average difference in graduate earnings by gender and second-level school type before any attempt is made to explain part of these wage differences. The model attempts to explain part of the variation in wages using the full set of student characteristics described in Section 3.3, meaning that comparisons can be made across like-for-like graduates.

For the gender models, results are presented as percentage differences from male earnings while for the school type models, results are presented as percentage differences from the earnings of those that came from a standard school. Different to the case in the previous section, full models excluding new entrant information (labelled as: 'Full Model excl. NE') are directly comparable for undergraduates and postgraduates as they both include the same controls and are estimated for the same graduation cohorts.[31]

6.2 Graduates' Earnings by Gender

The percentage difference in female graduates' earnings compared to males is shown (on an inverted axis) in Figure 23 for undergraduates and in Figure 24 for postgraduates.

Results from the raw model shows that male undergraduates earn more than females and the difference gets larger over time. This closely mirrors the descriptive statistics of average earnings by gender, in Section 4.5.[32] After one year, female undergraduates earn 3.5 percent less than males and the difference grows, almost linearly, to 14 percent after eight years. If these differences in raw earnings persist or continue to diverge into the future it will represent a substantial difference in earnings between genders over a lifetime.

However, much of this difference can be explained in the full model by differences in the characteristics of male and female graduates (which include an indicator for motherhood). After controlling for these differences, the pay gap is reduced from 3.5 percent to less than 2 percent after one year and from 10 percent to 3 percent after six years. Also apparent is that the range of plausible estimates from the full model increases over time (indicated by the 95% confidence intervals) as fewer cohorts of graduates are included in the models each subsequent year after graduation.

After eight years, when comparing like-for-like graduates and controlling for differences in student characteristics (excluding prior academic attainment, age at entry to higher education and socio-economic group) the pay gap shrinks from 14 percent to 2 percent. Furthermore, for one to six years after graduation, results from the full model excluding new entrant information closely follow the results from the full model which includes this

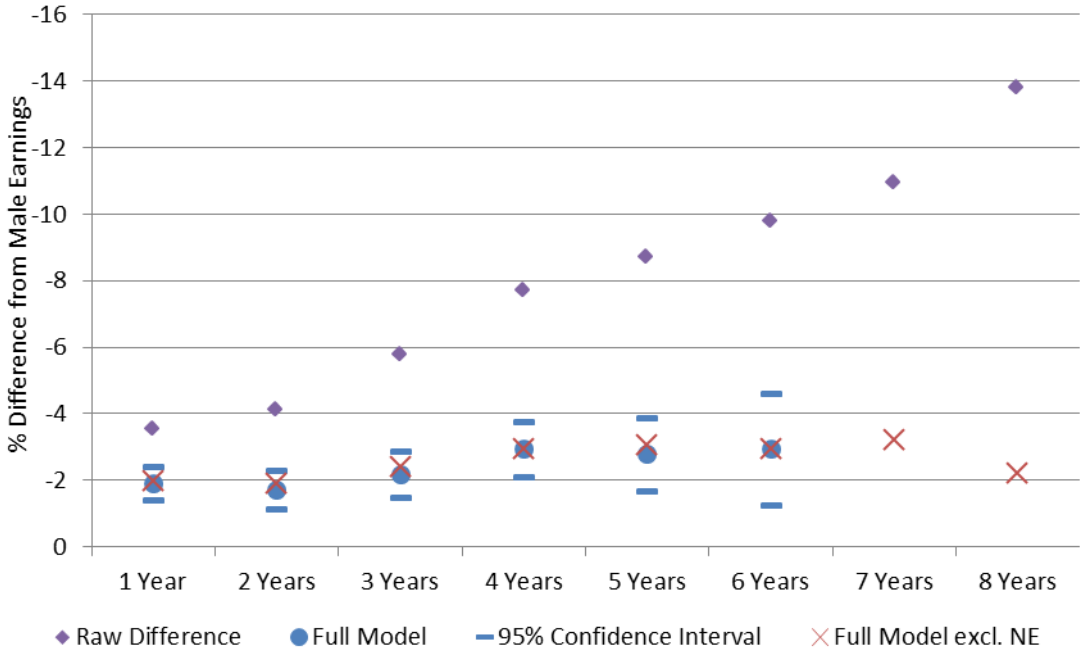
[31] For undergraduates, the raw and full models are not directly comparable as the former is estimated for graduation cohorts from 2010 while the latter is estimated for graduation cohorts after 2012. However, comparisons are made in the text to illustrate the proportion of the variation in wages that can be explained by graduate characteristics in the model. Estimates of the raw model remain within one percentage point whether it is estimated using graduation cohorts from 2010 or 2012. Detailed regression results showing both the raw and full model results are shown in Table E.9.

[32] Note however, that the average raw difference is not directly comparable to Figure 13 in Section 4.5 as the descriptive statistics are simple averages while the model differences are model-based estimates of log-earnings (transformed into percentage differences).

information. This suggests that the full model's results would be similar if the new entrant information were available to fully model earnings seven and eight years after graduation.

While much of the difference in weekly earnings between male and female graduates can be explained by degree course choices and other graduate characteristics (which include an indicator for motherhood), a statistically significant gap remains. However, as noted in Section 5.5, to fully determine the gender pay gap, hourly wage data may prove a more appropriate basis for comparing economic returns to work among different groups as hours of work may vary by gender.

Figure 23: Female Undergraduates' Earnings 1 to 8 Years after Graduation (%)



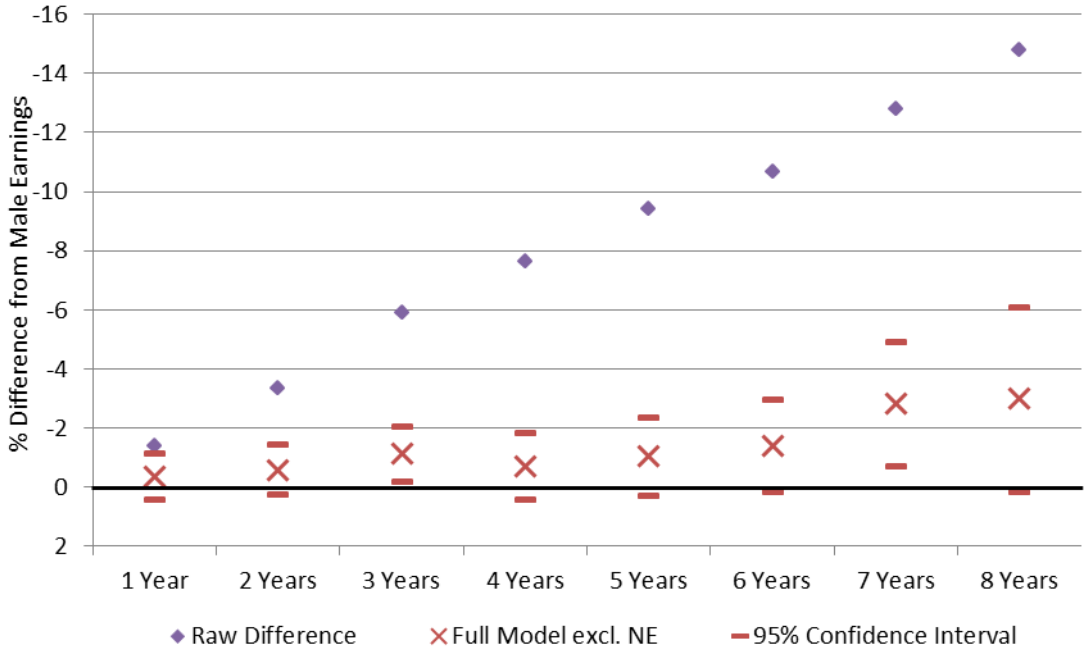
Note: Results are conditional on graduates being in substantial employment. The 'Raw Difference' is the difference in earnings from the model containing graduation cohort indicators and gender and is estimated for graduation cohorts from 2010 to 2017. The 'Full Model' is estimated for graduation cohorts from 2012 to 2017 and includes additional controls for course name, institution, award type, final degree grade, county of origin, age at entry to higher education, LC points, LC Maths and English grades, second-level school type, deprivation index score of schools' Electoral Division, socio-economic group, an indicator for motherhood and sector of employment. The 'Full Model excl. NE' excludes characteristics relating to a graduate's new entrant information (which are their age at entry to higher education, LC Points, LC Maths and English grades and socio-economic group) and is estimated for graduation cohorts from 2010 to 2017. Detailed regression results are shown in Table E.9.

The trend in raw postgraduate earnings by gender is similar to undergraduates. In raw terms, female postgraduates earn 1.5 percent less than males one year after graduating and the difference grows, almost linearly, to 15 percent after eight years. However, after controlling for differences in course choices, student characteristics (excluding prior academic attainment, age at entry to higher education and socio-economic group) the pay gap shrinks from 1.5 percent to be not statistically different after one year and from 15

percent to 3 percent after eight years (which is also not statistically significant). These differences between males and females effectively explain all the difference in earnings up to six years after graduating. After seven and eight years, the range of plausible estimates (indicated by the 95% confidence intervals) suggests that there is greater uncertainty as fewer cohorts of graduates are observed this length of time in the labour market. It is worth reiterating that while the indicator for motherhood in the model partly explains some of the differences in earnings it may also partially capture part-time employment amongst females as hours worked are not observed in the data.

Comparing undergraduates and postgraduates in the full model of earnings (excluding new entrant information) shows that the gender differences are smaller for postgraduates, up to six years after graduating. This implies that more of the variation in earnings by gender can be explained for postgraduates even when excluding prior academic attainment, age at entry to higher education and socio-economic group as explanatory factors.

Figure 24: Female Postgraduates' Earnings 1 to 8 Years after Graduation (%)



Note: Results are conditional on graduates being in substantial employment. The 'Raw Difference' is the difference in earnings from the model containing graduation cohort indicators and gender and is estimated for graduation cohorts from 2010 to 2017. The 'Full Model excl. NE' is estimated for graduation cohorts from 2010 to 2017 and includes additional controls for course name, institution, award type, final degree grade, county of origin, second-level school type, deprivation index score of schools' Electoral Division, an indicator for motherhood and sector of employment. Detailed regression results are shown in Table E.10.

6.3 Graduates' Earnings by Second-Level School Type

The percentage difference in earnings for graduates who previously attended a DEIS school compared to graduates previously who attended a standard school is shown (on an inverted axis) in Figure 25 for undergraduates and in Figure 26 for postgraduates. The percentage difference in earnings for graduates who attended a fee-paying school compared to graduates who attended a standard school is presented in Figure 27 for undergraduates and Figure 28 for postgraduates. It is worth noting that the average raw difference in earnings closely mirrors the descriptive statistics of average earnings by school type, in Section 4.5.[33]

6.3.1 DEIS Schools

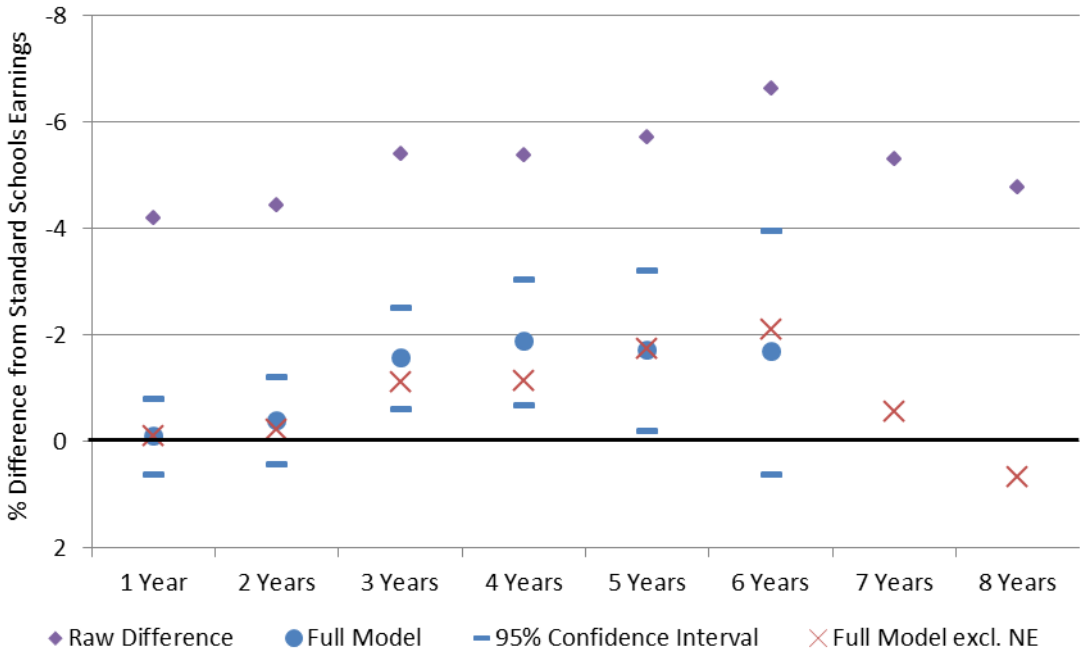
The raw difference shows that undergraduates who previously attended a DEIS school earn 4 percent less one year after graduating than graduates who attended a standard school and the difference levels off at around 5 percent after three years.

However, much of this difference can be explained in the full model by differences in the characteristics of graduates who previously attended different types of schools. After controlling for the course studied and other characteristics the difference is reduced considerably from 4 percent to be not statistically different after one year and from 7 percent to 2 percent after six years, which is also not significant. The insignificance of the latter estimate is also driven by a wider range of uncertainty (indicated by the 95% confidence intervals) as fewer cohorts of graduates are included in the models each subsequent year after graduation.

It is interesting to note that for both the raw model and the full model (excluding new entrant information) the difference in earnings is falling after six years and is not statistically different from zero. This indicates that differences in the course studied and other characteristics can explain all the differences in earnings between the two groups for undergraduates after six years.

[33] Note however, that the average raw difference is not directly comparable to Figure 14 in Section 4.5 as the descriptive statistics are simple averages while the model differences are model-based estimates of log-earnings (transformed into percentage differences).

Figure 25: Undergraduates' Earnings 1 to 8 Years after Graduation for those that Attended DEIS Schools (%)

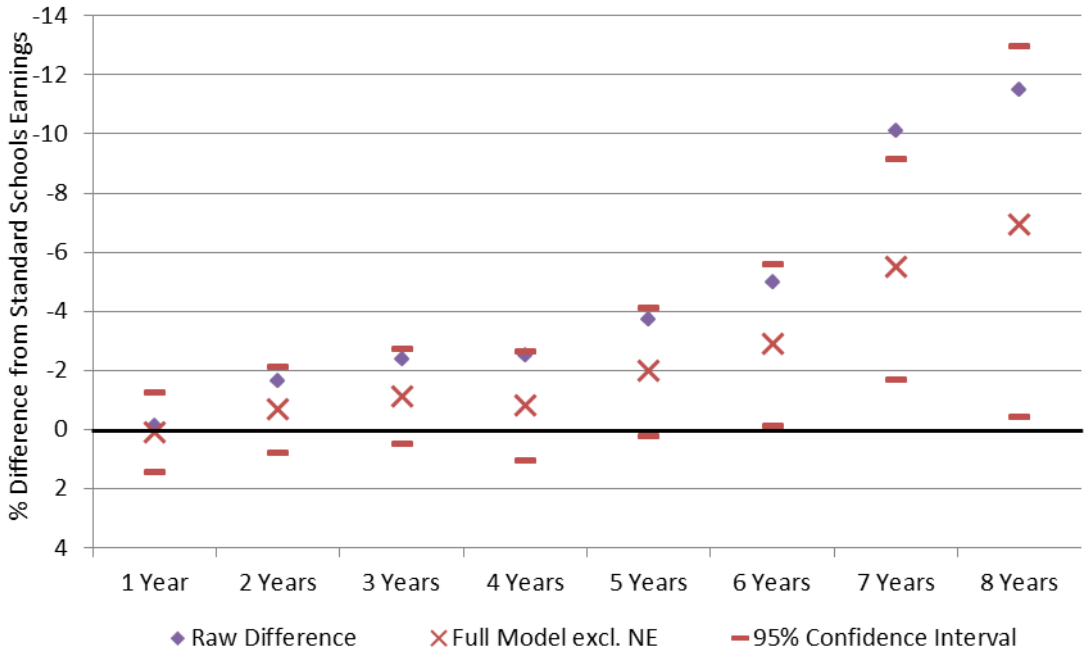


Note: Results are conditional on graduates being in substantial employment. The 'Raw Difference' is the difference in earnings from the model containing graduation cohort indicators and school type and is estimated for graduation cohorts from 2010 to 2017. The 'Full Model' is estimated for graduation cohorts from 2012 to 2017 and includes additional controls for course name, institution, award type, final degree grade, gender, county of origin, age at entry to higher education, LC points, LC Maths and English grades, deprivation index score of schools' Electoral Division, socio-economic group, an indicator for motherhood and sector of employment. The 'Full Model excl. NE' excludes characteristics relating to a graduate's new entrant information (which are their age at entry to higher education, LC Points, LC Maths and English grades and socio-economic group) and is estimated for graduation cohorts from 2010 to 2017. Detailed regression results are shown in Table E.9.

The trend in raw postgraduate earnings differs from undergraduates. In raw terms, postgraduates who previously attended DEIS schools earn the same as their peers who attended standard schools one year after graduating but the difference rises to 11.5 percent after eight years. For undergraduates, these differences were larger one year after graduation but levelled off after three years. Comparing the full model (that excludes new entrant information) for undergraduates and postgraduates shows that the range of uncertainty is greater for the postgraduate model given the smaller number of observations.

After controlling for differences in the course studied and student characteristics (excluding prior academic attainment, age at entry to higher education and socio-economic group) the differences in earnings are not statistically significant for the first six years after graduation. However, despite comparing like-for-like postgraduates and increasing uncertainty, the differences in earnings are significant after seven and eight years.

Figure 26: Postgraduates' Earnings 1 to 8 Years after Graduation for those that Attended DEIS Schools (%)



Note: Results are conditional on graduates being in substantial employment. The 'Raw Difference' is the difference in earnings from the model containing graduation cohort indicators and school type and is estimated for graduation cohorts from 2010 to 2017. The 'Full Model excl. NE' is estimated for graduation cohorts from 2010 to 2017 and includes additional controls for course name, institution, award type, final degree grade, gender, county of origin, deprivation index score of schools' Electoral Division, an indicator for motherhood and sector of employment. Detailed regression results are shown in Table E.10.

6.3.2 Fee-Paying Schools

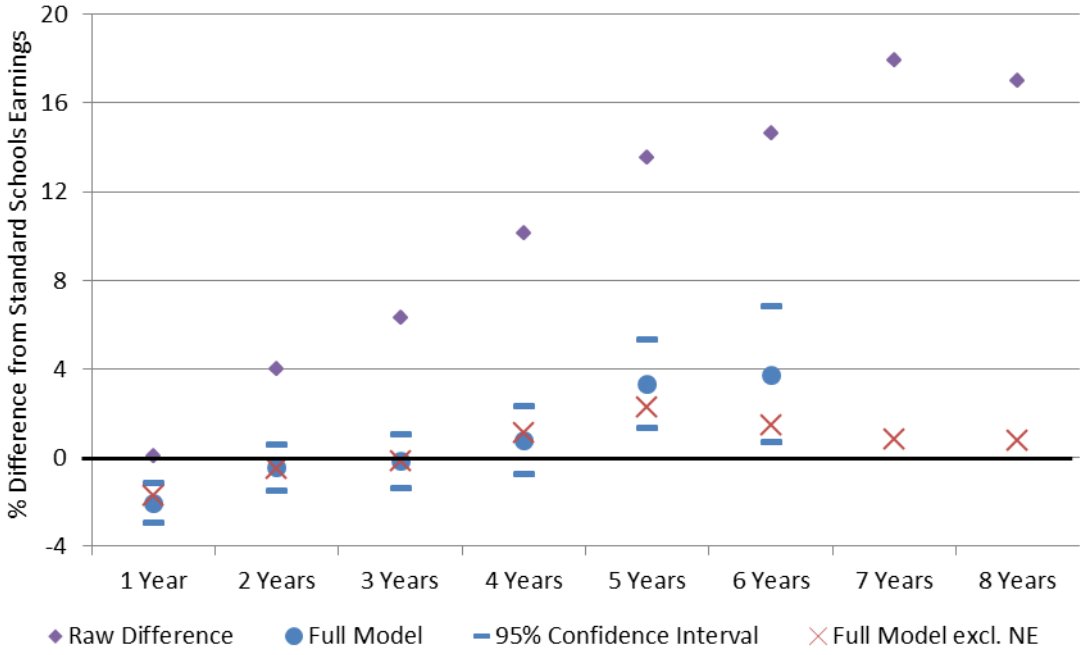
Results from the raw model shows that undergraduates who attended a fee-paying school earn the same one year after graduating as graduates who attended standard schools. Over time however, the difference grows, almost linearly, to 18 percent after seven years and then falling to 17 percent after eight years.

When like-for-like graduates are compared in the full model, undergraduates who attended fee-paying schools earn nearly 2 percent less than those who attended standard schools one year after graduation. Two and three years after graduating the differences are effectively zero while after five and six years, the difference between those who attended fee-paying schools versus standard schools rises to nearly 4 percent. This nonetheless, represents a substantial reduction in the raw difference of 14 and 15 percent after five and six years respectively.

It is interesting to note that the full model (excluding new entrant information) closely follows the full model (which includes controls for prior academic attainment, age at entry to higher education and socio-economic group). The model excluding these controls shows that the difference is falling after six years and is not statistically different from zero.

Therefore, differences in the course studied and other characteristics can explain all the differences in earnings between the two groups after seven and eight years.

Figure 27: Undergraduates' Earnings 1 to 8 Years after Graduation for those that Attended Fee-Paying Schools (%)

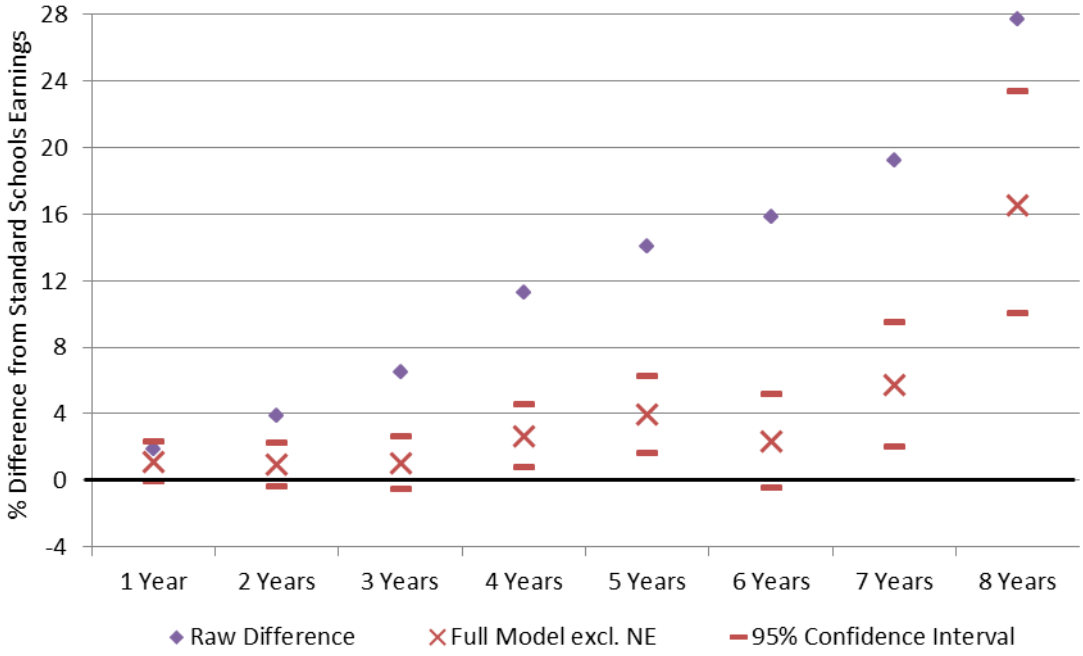


Note: Results are conditional on graduates being in substantial employment. The 'Raw Difference' is the difference in earnings from the model containing graduation cohort indicators and school type and is estimated for graduation cohorts from 2010 to 2017. The 'Full Model' is estimated for graduation cohorts from 2012 to 2017 and includes additional controls for course name, institution, award type, final degree grade, gender, county of origin, age at entry to higher education, LC points, LC Maths and English grades, deprivation index score of schools' Electoral Division, socio-economic group, an indicator for motherhood and sector of employment. The 'Full Model excl. NE' excludes characteristics relating to a graduate's new entrant information (which are their age at entry to higher education, LC Points, LC Maths and English grades and socio-economic group) and is estimated for graduation cohorts from 2010 to 2017. Detailed regression results are shown in Table E.9.

The trend in raw earnings for postgraduates who previously attended fee-paying schools is similar to undergraduates. In raw terms, postgraduates who attended fee-paying schools earn 2 percent less than their peers who attended standard schools one year after graduating but the difference rises to 28 percent after eight years.

However, differences in the course studied and other characteristics (excluding the new entrant information) can essentially explain this difference for most of the first six years after graduating. However, seven and eight years after graduation, the difference between those who attended fee-paying schools versus standard schools rises to 6 percent and 16.5 percent respectively. This contrasts to the case for undergraduates where seven and eight years after graduating, differences in graduates' characteristics fully explained the differences in earnings between the two groups.

Figure 28: Postgraduates' Earnings 1 to 8 Years after Graduation for those that Attended Fee-Paying Schools (%)



Note: Results are conditional on graduates being in substantial employment. The 'Raw Difference' is the difference in earnings from the model containing graduation cohort indicators and school type and is estimated for graduation cohorts from 2010 to 2017. The 'Full Model excl. NE' is estimated for graduation cohorts from 2010 to 2017 and includes additional controls for course name, institution, award type, final degree grade, gender, county of origin, deprivation index score of schools' Electoral Division, an indicator for motherhood and sector of employment. Detailed regression results are shown in Table E.10.

7 Conclusions

This report has, for the first time in an Irish context, examined the labour market earnings of higher education graduates in their early careers using linked administrative data and regression analysis to take into consideration prior academic attainment and background characteristics. The report provides new evidence on differences in graduates' earnings across degree subjects, institution types, gender and socio-economic background.

The findings show that the subjects that students choose to study varies by their gender, socio-economic background and prior academic achievement. Accounting for these differences has an impact on predicted returns to studying a particular degree subject. Undergraduates from Medicine have the highest earnings in both raw and model predicted terms, four years after graduation. In raw terms, postgraduates from Physics have the highest average earnings. However when like-for-like graduates are compared, Nursing & Midwifery graduates earn the most. Undergraduates and postgraduates from Arts & Humanities fields of study earn the least.

Prior academic attainment has been shown to vary across institution types. There is also considerable variation in the degree subjects offered across institution types. When these differences are taken into account, by comparing like-for-like individuals, the returns to studying undergraduate programmes (in terms of predicted earnings) at universities decreases while the returns to studying at institutes of technology and colleges increases.

The findings show that female graduates earn less than males and the difference grows over time. However, much of this gap can be explained by differences in subject choices and differences in the characteristics of male and female graduates (which include an indicator for motherhood). After controlling for these differences, the pay gap is reduced for undergraduates from 3.5 percent to less than 2 percent after one year and from 13 percent to 3 percent after six years. For postgraduates, differences in subject choices and other student characteristics effectively explain the entire earnings gap up to six years after graduating. Graduates' choice of institution and course explains most of this difference.

The findings show that the type of second-level school that individuals attended can affect what and where individuals choose to study. Furthermore, when it comes to prior academic attainment, graduates who attended fee-paying schools outperform graduates who attended standard schools, who in turn outperform graduates that attended DEIS schools.

These educational choices and other graduate characteristics can effectively explain the earnings differentials between undergraduates who attended DEIS schools compared to standard schools in their first two years after graduating and after six years. After controlling for these differences, for postgraduates, the earnings differential between both groups is generally not statistically different for each year after graduating. Graduates' choice of institution and course explains most of the raw difference in earnings by school type.

The findings show that when comparing like-for-like undergraduates who attended fee-paying schools and standard schools, the differences in educational choices and other graduate characteristics effectively explain the differences in earnings for the first four years and years seven and eight after graduation. For postgraduates, differences in the course studied and other characteristics can essentially explain differences in earnings between the two groups for the first three years after graduating.

The analysis in this report contributes to a growing evidence base on graduates' earnings in the Irish labour market. The report shows that differences in raw earnings can largely be explained by differences in graduates' characteristics, particularly their choice of institution, choice of course and performance in the Leaving Certificate (as a proxy for ability). These characteristics (amongst others) are a key consideration when comparing earnings by field of study, institute type, gender and second level school type. However, differences in earnings sometimes remain even after controlling for the above factors and comparing like-for-like graduates. As more data becomes available in this longitudinal dataset in the following years, analysis of graduates' outcomes will become richer, allowing further investigation into key policy issues.

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Appendix

Appendix A: Sample Selection

Table A.2 describes the sample selection process used this report. A number of restrictions are applied to the population of graduations from HEA-funded institutions which is called the 'Graduation Sample' in column 1.

- The HEA graduation records are missing PPSN identifiers for nearly 80 percent of non-Irish domiciled graduates.[34] This arises because non-Irish domiciled students are not required to apply for a PPSN to study at an Irish HEI. Non-Irish domiciled graduates were removed from the analysis to allow the report to focus on the outcomes for Irish graduates. These numbered approximately 40,000. A further 2,500 graduations were Irish domiciled but were from Northern Ireland and these were also removed.
- The RCSI are missing PPSN identifiers for almost 75 percent of their graduates. Approximately 7,000 graduations from RCSI were removed to prevent the results for this cohort being estimated for a minority of the population.
- Around 7,000 springboard graduates were removed as these students are mostly older with different employment histories.
- Around 500 individuals had more than one graduation in the same year. Examples include a graduate who received a Diploma in Education in combination with an Honours Degree in another course or a graduate receiving a Certificate in Religious Education in combination with an Honours Degree in Education. In these cases, the lower NFQ award type was removed.

It is important to note that the same individual can have multiple graduations over different years. There are 357,166 individuals in the dataset but 437,445 graduation records. Table A.1 shows the number of graduations for each individual in the dataset. One-fifth of individuals have more than one graduation. 17.5 percent of individuals have two graduations, 2.3 percent have three graduations while a small number have four or five graduations. In total, 71,045 individuals had more than one graduation.

[34] Irish domicile refers to only to the Republic of Ireland.

Table A.1: Number of Graduations per Individual

Number of Graduations	Number	Percent
1	286,121	80.1%
2	62,390	17.5%
3	8,102	2.3%
4	527	0.1%
5	26	0.0%
Total No. of Individuals	357,166	100%

Note: The total number of individuals corresponds to the 'Graduates Sample' sample (column 2) in Table A.2.

To ensure that regressions are based on unique individuals, rather than multiple graduations relating to the same individual, the analysis of earnings is restricted to only the individual's latest graduation.[35] This implies that an individual's earnings, after they graduate, are only attributable to their latest graduation. This restriction is applied in the 'Graduates Sample' in column 2 of Table A.2. In total, 80,279 graduation records are dropped relating to 71,045 individuals who had more than one graduation.[36]

However, out of the 71,045 individuals who had more than one graduation, 16,455 individuals have two distinct periods in the labour market arising from two different graduations. A distinct period in the labour market is defined as an individual graduating from a course (and not enrolling in another full-time course in higher education) and then entering substantial employment. These 16,455 individuals are re-included in the analysis (in the 'Latest Graduations' in column 3) because their earnings after each graduation are separate.[37]

To explain further, consider an individual who graduates with an Ordinary Degree in 2010 and graduates from an Honours Degree in 2011. They then enter the labour market in 2012 and 2013. In 2014 they enrol in a full-time Taught Masters, graduate in 2015 and renter employment in 2016. Thus, this individual has two distinct periods in the labour market arising from different graduations. Their earnings in 2012 and 2013 are earned one and two years after graduating from their Honours Degree while their earnings in 2016 and after are attributable to their Masters Degree.

[35] 99.3 percent of individuals' latest graduation corresponds to their highest NFQ level award. A typical example of those whose latest graduation is at a lower NFQ level than previous awards are individuals with a Level 9 Masters qualification who later graduate with a Level 8 Professional Diploma in Education.
[36] Additional information on individuals' previous graduations is described in Appendix C: Multiple Graduations in Different Years.
[37] 1,372 of the 8,279 individuals have more than two distinct periods in the labour market. These earlier graduations are not considered.

The sample is further restricted in column 4 to full-time young graduates to enable the report to focus on the cohort of graduates who attended higher education full-time soon after leaving secondary school.[38] Around 160,000 mature graduates were removed and a further 7,000 young part-time graduates were removed.

A CSOPPSN identifier is required to facilitate linking of graduation records to labour market earnings. Around 5 percent of full-time young graduates are missing a PPSN identifier and these are dropped. The remaining number of graduates with a valid CSOPPSN is shown in column 5 of Table A.2. To guard against the possibility that CSOPPSN is missing in a non-random fashion, all estimates are weighted by institution, award type and graduation cohort. Full description of the weighting method is given in Appendix D: Graduates with Missing PPSN.

Column 6 shows the 'Earnings Sample'. These are the individuals who have substantial earnings on record (while not being enrolled in another full-time higher education course) in any year after graduating.

Columns 7 to 14 show the number of individuals with substantial earnings 1 to 8 years after graduating, while not being enrolled in another higher education course in these years. In addition, the top 1 percent of earnings are removed from each year since graduation (columns 7 – 14) to prevent a small number of outliers disproportionally affecting results.[39] In total, 5,000 observations are dropped for this reason.

[38] Appendix A describes the age threshold for young graduates which is based on their type of degree awarded.
[39] This means that an individual's earnings may be dropped in some years after graduating but not necessarily the rest. The top 1 percent of earnings are removed by year since graduating to prevent excess earnings being omitted from individuals in the data who spent the longest period of time in the labour market. This is because these individuals who are in the labour market the longest, in general, have the highest earnings in the data.

Table A.2: Sample Selection: All Graduates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Graduation	Graduations	Graduates	Latest	Young	Valid	Earnings	Substantial Employment After:							
Cohort	Sample	Sample	Graduations	Full-time	PPSN	Sample	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years	7 Years	8 Years
2010	51,008	37,349	40,819	23,072	21,247	18,312	13,227	12,775	12,453	12,404	12,366	12,360	12,327	12,629
2011	52,468	38,619	42,076	23,042	21,802	18,897	14,255	13,643	13,428	13,401	13,247	13,141	13,328	
2012	53,384	39,899	42,959	23,988	22,790	19,838	15,478	14,781	14,669	14,441	14,117	14,193		
2013	55,272	42,728	45,302	24,626	23,481	19,984	15,997	15,379	15,106	14,743	14,590			
2014	56,335	45,216	47,171	25,451	24,003	20,430	17,211	16,398	15,988	15,777				
2015	54,047	44,604	45,843	24,339	23,493	19,411	16,868	15,880	15,898					
2016	56,751	50,571	51,271	28,220	27,240	20,967	18,920	18,545						
2017	58,180	58,180	58,180	32,446	31,587	20,849	20,757							
Total	437,445	357,166	373,621	205,184	195,643	158,688	132,713	107,401	87,542	70,766	54,320	39,694	25,655	12,629

Note: For the most recent (2017) graduation cohort, the number of graduates in column 2 is equal to the number of latest graduations in column 3. This is because a later graduation for these individuals cannot be observed yet. However, it is known whether these graduates are enrolled in another full-time course in higher education in 2018 (one year after graduating) and these individuals are excluded in the earnings samples in columns 6 and 7.

Table A.3: Undergraduate Observations

Graduation Cohort	(1) Earnings Sample	(2) Substantial Employment after: 1 Year	(3) 2 Years	(4) 3 Years	(5) 4 Years	(6) 5 Years	(7) 6 Years	(8) 7 Years	(9) 8 Years
2010	13,797	9,667	9,360	9,106	9,114	9,128	9,146	9,131	9,387
2011	14,517	10,734	10,263	10,146	10,133	9,988	9,917	10,026	
2012	15,616	12,035	11,461	11,370	11,202	10,913	10,960		
2013	15,710	12,429	11,876	11,681	11,405	11,294			
2014	15,906	13,249	12,608	12,285	12,181				
2015	15,674	13,520	12,738	12,772					
2016	16,809	15,068	14,839						
2017	16,982	16,981							
Total	125,011	103,683	83,145	67,360	54,035	41,323	30,023	19,157	9,387
NE Total	96,697	83,282	63,522	48,108	34,788	22,207	10,960		

Note: The shaded area shows the graduation cohorts (post 2012) for which new entrant (NE) information is available.

Table A.4: Postgraduate Observations

Graduation Cohort	(1) Earnings Sample	(2) Substantial Employment After: 1 Year	(3) 2 Years	(4) 3 Years	(5) 4 Years	(6) 5 Years	(7) 6 Years	(8) 7 Years	(9) 8 Years
2010	4,515	3,560	3,415	3,347	3,290	3,238	3,214	3,196	3,242
2011	4,380	3,521	3,380	3,282	3,268	3,259	3,224	3,302	
2012	4,222	3,443	3,320	3,299	3,239	3,204	3,233		
2013	4,274	3,568	3,503	3,425	3,338	3,296			
2014	4,524	3,962	3,790	3,703	3,596				
2015	3,737	3,348	3,142	3,126					
2016	4,158	3,852	3,706						
2017	3,867	3,776							
Total	33,677	29,030	24,256	20,182	16,731	12,997	9,671	6,498	3,242

Appendix B: Details of Student Characteristics

Young Graduates Detail

Young graduates, for the purposes of this analysis, are the cohort of graduates who attend higher education soon after leaving secondary school. The distinction between young and mature graduates are determined using an individual's age at graduation in combination with award type as set out in Table B.1.

Table B.1: Threshold Ages for Young Graduates for each Award Type

Award Type	Maximum Age at Graduation
Certificate	21
Ordinary Degree	23
Honours Degree	24 plus 1 for each year the course exceeds three years
Postgraduate Diploma / Certificate	26
Taught / Research Masters	27
PhD	29

HEA-Funded Institutions Detail

Table B.2: HEA-Funded Institutions by Institution Types

Universities	Colleges	Institutes of Technology
Dublin City University (DCU)	Mary Immaculate College, Limerick	Athlone IT
National University of Ireland, Galway	Mater Dei Institute of Education	Cork IT
National University of Ireland, Maynooth	National College of Art and Design (NCAD)	Carlow IT
Trinity College Dublin (TCD)	St. Angela's College of Home Economics, Sligo	Dublin Institute of Technology (DIT)
University College Cork (UCC)	St. Patricks College, Drumcondra	Dun Laoghaire Institute of Art, Design and Technology (IADT)
University College Dublin (UCD)		Dundalk IT
University of Limerick (UL)		Galway-Mayo IT (GMIT)
		IT Blanchardstown
		IT Sligo
		IT Tallaght
		IT Tralee
		Letterkenny IT
		Limerick IT
		Waterford IT

Note: RCSI is not included as it is missing PPSN for 80 percent of graduates. Mater Dei Institute of Education and St. Patricks College, Drumcondra were incorporated into DCU from the 2016/17 academic year. Therefore, graduates from these institutions in 2017 are recorded as graduating from DCU.

Award Type and NFQ Level Detail

In some instances, the NFQ Level does not correlate exactly to the respective award types. The NFQ level was recoded to align with the respective award types as below. In addition, some award types were combined as some new award types were created for graduation cohorts after 2016 and graduates from some awards were comparatively small. The seven 'Merged Award Types' are included as controls in all regression models.

Table B.3: Award Type and NFQ Level

Merged Award Type	Award Type	NFQ Level
Undergraduate / Higher Cert	Undergraduate Certificate[1]	6
	Higher Certificate[1]	6
Ordinary Degree	Ordinary Degree	7
Honours Degree	Honours Degree	8
Postgraduate Diploma / Cert	Higher Diploma[2]	8
	Postgraduate Diploma[2]	9
	Postgraduate Certificates	9
Taught Masters	Taught Masters	9
Research Masters	Research Masters	9
PhD	PhD	10

Note: [1] Undergraduate Certificates and Higher Certificates were disaggregated for graduation cohorts from 2016 to reflect the different credits associated with both qualifications. Previously they were just recorded as Undergraduate Certificates.
[2] Award types for Higher Diplomas and Postgraduate Diplomas were disaggregated from 2016 to reflect their different NFQ levels. Previously, they were just recorded as Postgraduate Diplomas.

Final Degree Grade Detail

Grading practices differ between courses and across institutions. For the purposes of this report, the grades awarded for each course were coded into four standard categories:

- First Class Honours (H1)
- Upper Second Class Honours (H21)
- Lower Second Class Honours (H22)
- Third Class Honours (H3)

In addition, an 'Other' category captures non-standard grade categories for graduates of non-research programmes.[40] These included grades of 'Other Honours', 'Credit', 'Not Specified', 'Recommended (for Masters Degrees)' and 'Unclassified'. This category is

[40] Research Masters or PhD graduates are awarded degrees without a standard grade classification. Their grade is therefore excluded from the regression analysis as it is uniform and perfectly collinear with their type of award.

included in the regression analysis but only comprises less than 1 percent of graduations for the 'Earnings Sample' (column 6 in Table A.2).

The range of possible grades awarded for each course were analysed and certain records were reassigned to one of the four classifications above. For instance, grades of Distinction, Merit 1, Merit 2 and Pass were respectively assigned to H1, H21, H22, H3.

Some courses awarded both a H3 and a Pass and these were both assigned to a H3. Some courses were awarded a generic Second Class Honours (H2) grade together with either an Upper or Lower Second Class Honours (H21 and H22). The H2 in these cases was deemed to be an Upper or Lower Second Class Honours, depending on which class was missing.

However, in some cases, it was unclear whether a generic Second Class Honours (H2) was equivalent to either an Upper or Lower Second Class Honours (H21 or H22):

- Some courses were awarded a generic Second Class Honours (H2) grade in conjunction with both a H21 and a H22. In these cases, it was assumed that a H2 is equivalent to an Upper Second Class Honours (H21).
- Some courses were awarded a generic Second Class Honours (H2) grade without either a H21 or H22 (or a Merit 1 or a Merit 2). In these cases, it was assumed that a H2 is equivalent to a Lower Second Class Honours (H22).

Calculation of Leaving Certificate Points Detail

Information on Leaving Certificate points comes from the HEA's new entrant records. It is reported by each HEI and it represents the total points awarded by the HEI to gain admission to a particular course. It therefore includes additional points for portfolios and bonus points for sitting exams through Irish. However, the data also contains each student's Leaving Certificate subject and grade so, a consistent measure of Leaving Certificate points are calculated using each student's six best subjects.[41]

It is worth noting that applicants can meet the matriculation requirements of a course using multiple sittings of the Leaving Certificate while points can only be calculated on the basis of one sitting. These separate sittings of the Leaving Certificate are not separated in the data so Leaving Certificate points are calculated using a maximum of 10 subjects.

For individuals whose points could not be calculated in this way, their reported points were used when available. Points were then grouped into ranges from 155-200, 205-250, …,

[41] Most new entrant information predates the introduction of bonus points for Leaving Certificate Mathematics (in 2012). Therefore, these bonus points are excluded to ensure consistency.

555-600. Points below 155 and above 600 (a small number of individuals had reported points above 600) were coded into an 'other' category. These comprise around 1 percent of the 'Earnings Sample' for undergraduate post 2012 graduation cohorts (shaded area of column 1 in Table A.3). Points could not be calculated for an additional 4 percent of these graduates and are coded into a missing category which is included in all estimates throughout this report. Note that for descriptive statistics in Section 4.4 the missing category comprises both the 'other' and 'missing' categories.

Socio-economic Group Detail

Students' socio-economic group is based on their fathers' occupation. The information is collected from students' responses to the Equal Access Survey which is administered to all undergraduate new entrants at registration. Occupational information is coded into eleven socio-economic groups following CSO procedures. These are detailed in Table B.5.

NACE Sector Detail

The sectors of employment in this report are based on the alphabetical letter of the NACE code (Revision 2). These are detailed in Table B.5.

Age at Entry to Higher Education Detail

Age at entry to higher education is not directly observed on the HEA's new entrant records. However, graduates' age and year of graduation is available in the graduation records. These are used in conjunction with the year of entry to higher education to determine their age at entry. Age at entry is only used in undergraduate regression models and is missing for 3 percent of the 'Earnings Sample' for undergraduate post 2012 graduation cohorts (shaded area of column 1 in Table A.3).

It is preferable to control for graduates' age on entry to higher education rather than their age at graduation because the latter is closely correlated with their type of award. This is exacerbated by the fact that young graduates, in this report, are determined by their age in combination with award type.

Detail on Missing Values

Some of the variables in Section 3.3 have missing values for some students. These missing values are included as separate categories in the regression analysis in Sections 5 and 6 and are also shown in the descriptive statistics in Section 4.

Missing values occur for a variety of reasons such as variables containing 'Unknown' categories, inability to match graduate records to their new entrant records and

information being collected from voluntary surveys. Missing data related to age at entry to higher education and Leaving Certificate points are detailed above.

The variable recording students' county of origin includes fields for 'Unknown Dublin' and 'Unknown Ireland' which are included in regressions. Together, these comprise less than 1 percent of the 'Earnings Sample' (column 6 in Table A.2).

Leaving Certificate Mathematics and English grades are missing respectively for 14 percent and 13 percent of the 'Earnings Sample' for undergraduate post 2012 graduation cohorts (shaded area of column 1 in Table A.3).

The type of second-level school could not be identified for some graduates. This information is linked to an individual's graduation record from the last second-level school they attended (which is identified from the Department of Education and Skills PPOD records). In some instances, graduates could be of Irish domicile (defined as resident in Ireland for three of the last five years) but they may not have attended an Irish second-level school immediately prior to entering higher education. Also, the PPOD data is available from 2002 which allows eight years for the first observed postgraduates to graduate in 2010. This may be an insufficient time span for a 29-year-old PhD student who graduates in 2010 (29 is the oldest age for a PhD graduate to be considered a young graduate in the context of this report). This is reflected in the rates of missing school type information. School type is missing for 3 percent of the 'Earnings Sample' for undergraduates (column 1 in Table A.3) and for 11 percent of the 'Earnings Sample' for postgraduates (column 1 in Table A.4).

The student's socio-economic group is based on their father's occupation and is collected via a voluntary survey of undergraduate new entrants at registration. Socio-economic group information is missing for 31 percent of the 'Earnings Sample' for undergraduate post 2012 graduation cohorts (shaded area of column 1 in Table A.3) which may be due to non-response to the survey or to this specific question.

Field of Study Detail

HEIs assign each course into a field of study using the International Standard Classification of Education (ISCED) which is developed and used by the OECD and Eurostat. ISCED fields of study can be broken down into broad, narrow and detailed classifications.

The first column of Table B.4 shows the labels used throughout this report which are based on detailed ISCED fields of study. Some of these labels are in fact merged ISCED fields where sample sizes are small. In such cases, detailed fields of study are merged within the same narrow field of study. For example, Fine Arts (ISCED code 0215) is merged with Handicrafts (ISCED code 0214). Also, `interdisciplinary` courses are merged with courses 'not further defined or elsewhere classified' for the most part.

The ISCED classification system was revised for graduation cohorts from 2014 onwards. The final two columns show the relationship between the pre- and post-2014 ISCED fields of study. The majority of pre-2014 fields of study are simply mapped to post-2014 fields. However, a number of pre-2014 ISCED fields are mapped according to the course name as outlined below:

- Courses in Biology and Biochemistry (pre-2014 ISCED code 421) and Compute Science (pre-2014 ISCED code 481) were allocated to new ISECD fields on the basis of the course name.
- Courses in 'combined' fields of study are allocated according to the course name and any remaining courses are allocated to the indicated 'interdisciplinary' ISCED field.
- Courses in Balanced Combination across difference Fields of Education (pre-2014 ISCED code 900) and Balanced Combination of 'Humanities and Arts' and 'Social Sciences Business and Law' (pre-2014 ISCED code 910) are allocated according to the course name and any remaining courses are allocated to 'Arts not further defined'.

Table B.4: Description of Recoding Pre-2014 ISCED Fields of Study

Fields of Study Label	Post-2014 ISCED Code	Post-2014 ISCED Label	Pre-2014 ISCED Code and Label
Education	**1**	**Education**	**1 Education**
Pre-school teacher training & other	0110 &	Education n.f.d.	
	0112	Training for pre-school teachers	143 Training for pre-school teachers
Education science	0111	Education science	142 Education science
Teacher training without subject spec.	0113	Teacher training without subject specialisation	144 Training for teachers at basic levels
Teacher training with subject spec.	0114	Teacher training with subject specialisation	145 Training for teachers with subject specialisation
			146 Training for teachers of vocational subjects
Arts & Humanities	**2**	**Arts & Humanities**	**2 Humanities & Arts**
Other arts	0210	Arts n.f.d.	210 Combined Arts
Audio-visual & media production	0211	Audio-visual techniques and media production	213 Audio-visual techniques and media production
Fashion, interior & industrial design	0212	Fashion, interior and industrial design	214 Design
Fine arts & handicrafts	0213 &	Fine arts	211 Fine arts
	0214	Handicrafts	215 Craft skills
Music & performing arts	0215	Music and performing arts	212 Music and performing arts
Other humanities	0220	Humanities (except languages) n.f.d.	220 Combined Humanities
Religion & philosophy & history	0221 &	Religion and theology	221 Religion
	0222 &	History and archaeology	225 History and archaeology
	0223	Philosophy and ethics	226 Philosophy and ethics
Languages	0230 &	Languages n.f.d.[3]	
	0231 &	Language acquisition	222 Foreign languages
	0232	Literature and linguistics	223 Mother tongue
Interdisciplinary Arts & Humanities	0288	Interdisciplinary Arts & Humanities	200 Combined Arts & Humanities[1]
Social Sciences	**3**	**Social Sciences, Journalism & Information**	**3 Social Sciences Business & Law**
Other social & behavioural sciences	0310 &	Social and behavioural sciences n.f.d.	310 Combined Social and behavioural science
	0388	Interdisciplinary Social Sciences & Journalism & Information	300 Combined Social Science, Business and Law[1]
Economics	0311	Economics	314 Economics
Political sciences & civics	0312	Political sciences and civics	313 Political Science and civics
Psychology	0313	Psychology	311 Psychology
Sociology & cultural studies	0314	Sociology and cultural studies	312 Sociology and cultural studies
Journalism & information	0320 &	Journalism and information n.f.d.	320 Combined Journalism and Information
	0321 &	Journalism and reporting	321 Journalism and reporting
	0322	Library, information and archival studies	322 Library, information, archive
Business, Admin. & Law	**4**	**Business, Administration & Law**	**3 Social Sciences Business & Law**
Other business & administration	0410 &	Business and administration n.f.d.	340 Combined Business and Administration
	0488	Interdisciplinary Business Admin & Law	
Accounting & taxation	0411	Accounting and taxation	344 Accounting and taxation
Finance, banking & insurance	0412	Finance, banking and insurance	343 Finance, banking, insurance
Management & administration	0413	Management and administration	345 Management and administration
Marketing & advertising	0414	Marketing and advertising	342 Marketing and advertising
Secretarial, retail & work skills	0415 &	Secretarial and office work	346 Secretarial and office work
	0416 &	Wholesale and retail sales	341 Wholesale and retail sales
	0417	Work skills	347 Working life
Law	0421	Law	380 Law
Sciences, Maths & Stats.	**5**	**Natural Sciences, Mathematics & Statistics**	**4 Science, Mathematics & Computing**
Other biological & related sciences	0510	Biological and related sciences n.f.d.	420 Combined Life Science
Biology	0511	Biology	421 Biology and biochemistry[2]
Biochemistry	0512	Biochemistry	421 Biology and biochemistry[2]
Other earth & physical sciences	0530	Physical sciences n.f.d.	440 Combined Physical Science
	0532	Earth sciences	443 Earth Science
Chemistry	0531	Chemistry	442 Chemistry
Physics	0533	Physics	441 Physics

Fields of Study Label	Post-2014 ISCED Code	Post-2014 ISCED Label	Pre-2014 ISCED Code and Label
Other mathematics & statistics	0540	Mathematics and statistics n.f.d.	460 Combined Maths and Statistics
	0541	Mathematics	461 Mathematics
Statistics	0542	Statistics	462 Statistics
Environment	0520 & 0521 & 0522	Environment n.f.d.	421 Biology and biochemistry[2]
		Environmental sciences	422 Environmental Science
		Natural environments and wildlife	852 Natural environments and wildlife
Interdisc. Nat. Sci. Maths & Stats	0588	Interdisciplinary Natural Sciences Maths & Stats	400 Combined Science, Mathematics and Computing[1]
ICT	**6**	**Information & Communication Technologies**	**4 Science, Mathematics & Computing**
Other ICTs	0610 & 0688	Information and Communication Technologies (ICTs) n.f.d.	481 Computer Science[2]
		Interdisciplinary ICT	
Computer use	0611	Computer use	482 Computer Use
Database & network design & admin.	0612	Database and network design and administration	481 Computer Science[2]
Software & applications development	0613	Software and applications development and analysis	481 Computer Science[2]
Engineering, Man. & Const.	**7**	**Engineering, Manufacturing & Construction**	**5 Engineering, Manufacturing & Construction**
Other engineering	0710 & 0788 & 0712	Engineering and engineering trades n.f.d.	520 Combined Engineering & Engineering Trades
		Interdisciplinary Engineering Manufacturing & Construction	500 Combined Engineering, Manufacturing and Construction[1]
		Environmental protection technology	851 Environmental protection technology & 850 Combined Environmental Protection
Chemical engineering & processes	0711	Chemical engineering and processes	524 Chemical and process
Electricity & energy	0713	Electricity and energy	522 Electricity and energy
Electronics & automation	0714	Electronics and automation	523 Electronics and automation
Mechanics & metal trades	0715	Mechanics and metal trades	521 Mechanics and metal work
Motor vehicles, ships & aircraft	0716	Motor vehicles, ships and aircraft	525 Motor vehicles, ships and aircraft
Other materials & textiles & manufact.	0720 & 0722 & 0723 0724	Manufacturing and processing n.f.d.	540 Combined Manufacturing and Processing
		Materials (glass, paper, plastic and wood)	543 Materials (wood, paper, plastic, glass)
		Textiles (clothes, footwear and leather)	542 Textiles, clothes, footwear, leather
		Mining and extraction	544 Mining and extraction
Food processing	0721	Food processing	541 Food processing
Other architecture & construction	0730	Architecture and construction n.f.d.	580 Combined Architecture and building
Architecture & town planning	0731	Architecture and town planning	581 Architecture and town planning
Building & civil engineering	0732	Building and civil engineering	582 Building and civil engineering
Agriculture	**8**	**Agriculture, Forestry, Fisheries & Veterinary**	**6 Agriculture & Veterinary**
Crop & livestock production	0811	Crop and livestock production	621 Crop and livestock production
Other agriculture, forestry & fisheries	0812 & 0819 & 0821 & 0831 & 0888	Horticulture	622 Horticulture
		Agriculture n.f.d.	620 Combined Agriculture, forestry and fishery
		Forestry	623 Forestry
		Fisheries	624 Fisheries
		Interdisciplinary Agriculture Forestry Fisheries & Veterinary	600 Combined Agriculture & Veterinary[1]
Veterinary	0841	Veterinary	641 Veterinary
Health & Welfare	**9**	**Health & Welfare**	**7 Health & Welfare**
Dental studies & other health	0910 & 0911 & 0917 & 0988	Health n.f.d.	720 Combined Health
		Dental studies	724 Dental Studies
		Traditional and complementary medicine and therapy[3]	
		Interdisciplinary Health & Welfare	700 Combined Health and Welfare[1]
Medicine	0912	Medicine	721 Medicine
Nursing & midwifery	0913	Nursing and midwifery	723 Nursing and caring
Medical diagnostic & treatment tech.	0914	Medical diagnostic and treatment technology	725 Medical diagnostic and treatment technology
Therapy & rehabilitation	0915	Therapy and rehabilitation	726 Therapy and Rehabilitation
Pharmacy	0916	Pharmacy	727 Pharmacy

Fields of Study Label	Post-2014 ISCED Code	Post-2014 ISCED Label	Pre-2014 ISCED Code and Label
Other Welfare	0920 & 0921	Welfare n.f.d.	760 Combined Social Services
		Care of the elderly and of disabled adults[3]	
Child care & youth services	0922	Child care and youth services	761 Child Care and youth services
Social work & counselling	0923	Social work and counselling	762 Social work and counselling
Services	**10**	**Services**	**8 Services**
Hotel, restaurants & catering	1010 & 1013	Personal services n.f.d.	810 Combined Personal Services
		Hotel, restaurants and catering	811 Hotel, restaurant and catering
Sports	1014	Sports	813 Sports
Travel, tourism & leisure	1015	Travel, tourism and leisure	812 Travel, tourism and leisure
Occupational health & safety	1020 & 1022	Hygiene and occupational health services n.f.d.[3]	
		Occupational health and safety	862 Occupational health and safety
Security & transport services	1031 & 1032 & 1041	Military and defence	863 Military and defence
		Protection of persons and property	861 Protection of persons and property
		Transport services	840 Transport services
No observations	1011	Domestic services	814 Domestic services
No observations	1012	Hair and beauty services	815 Hair and beauty services
No observations	1021	Community sanitation	853 Community sanitation services
No observations			860 Combined Security Services
			900 Balanced Combination across difference Fields of Education[4]
			910 Balanced Combination of 'Humanities and Arts' and 'Social Sciences Business and Law'[4]

Note: n.f.d. is short for 'not further defined or elsewhere classified'.
[1] Pre-2014 Combined ISCED fields are first allocated according to the name of the course. Any remaining courses are allocated to the indicated 'interdisciplinary' ISCED field.
[2] The pre-2014 ISCED fields are allocated into new disaggregated fields according to course name.
[3] New field.
[4] Allocated according to course name. Any remaining courses are allocated to 'Arts n.f.d.'

Table B.5: Description of Student Characteristics

Variable	# Obs.	Percent	Variable	# Obs.	Percent
Graduation Year			**Institution Type**		
2010	18,312	11.5%	College	9,588	6.0%
2011	18,897	11.9%	Institute of Technology	57,607	36.3%
2012	19,838	12.5%	University	91,493	57.7%
2013	19,984	12.6%	Total	158,688	100%
2014	20,430	12.9%	**Institution**		
2015	19,411	12.2%	Athlone IT	3,214	2.0%
2016	20,967	13.2%	Carlow IT	2,968	1.9%
2017	20,849	13.1%	Cork IT	6,471	4.1%
Total	158,688	100%	DCU	10,889	6.9%
Field of Study			DIT	13,255	8.4%
Pre-school teacher training & other	719	0.5%	Dundalk IT	3,929	2.5%
Education science	1,588	1.0%	GMIT	4,029	2.5%
Teacher training without subject spec.	6,976	4.4%	IADT	2,021	1.3%
Teacher training with subject spec.	4,969	3.1%	IT Blanchardstown	1,450	0.9%
Other Arts	5,083	3.2%	IT Sligo	3,561	2.2%
Audio-visual & media production	2,929	1.8%	IT Tallaght	2,631	1.7%
Fashion interior & industrial design	2,077	1.3%	IT Tralee	1,850	1.2%
Fine arts & handicrafts	1,601	1.0%	Letterkenny IT	1,940	1.2%
Music & performing arts	2,104	1.3%	Limerick IT	4,122	2.6%
Other Humanities	3,200	2.0%	Mary I.	4,215	2.7%
Religion & philosophy & history	1,979	1.2%	Mater Dei	456	0.3%
Languages	3,591	2.3%	NCAD	1,138	0.7%
Interdisciplinary arts & humanities	1,101	0.7%	NUI Galway	13,097	8.3%
Other Social & behavioural sciences	2,255	1.4%	NUI Maynooth	8,457	5.3%
Economics	1,203	0.8%	St. Angela's	644	0.4%
Political sciences & civics	1,311	0.8%	St. Patrick's	3,135	2.0%
Psychology	1,997	1.3%	TCD	12,004	7.6%
Sociology & cultural studies	2,419	1.5%	UCC	16,470	10.4%
Journalism & information	1,208	0.8%	UCD	19,212	12.1%
Other Business & administration	13,249	8.3%	UL	11,364	7.2%
Accounting & taxation	4,981	3.1%	Waterford IT	6,166	3.9%
Finance banking & insurance	1,840	1.2%	Total	158,688	100%
Management & administration	9,016	5.7%	**Award Type**		
Marketing & advertising	4,112	2.6%	Undergraduate / Higher Cert	2,169	1.4%
Secretarial retail & work skills	793	0.5%	Ordinary Degree	8,849	5.6%
Law	5,378	3.4%	Honours Degree	113,993	71.8%
Other Biological & related sciences	1,818	1.1%	Postgraduate Diploma / Cert	6,526	4.1%
Biology	3,129	2.0%	Taught Masters	24,418	15.4%

Variable	# Obs.	Percent
Biochemistry	1,404	0.9%
Environment	1,473	0.9%
Other Earth & physical sciences	1,292	0.8%
Chemistry	1,632	1.0%
Physics	637	0.4%
Other mathematics & statistics	996	0.6%
Statistics	472	0.3%
Interdisc. nat. sci. maths & stats	1,119	0.7%
Other ICTs	3,219	2.0%
Computer use	1,002	0.6%
Database & network design & admin.	1,032	0.7%
Software & applications development	2,500	1.6%
Other Engineering	2,227	1.4%
Chemical engineering & processes	922	0.6%
Electricity & energy	1,040	0.7%
Electronics & automation	1,753	1.1%
Mechanics & metal trades	2,332	1.5%
Motor vehicles ships & aircraft	413	0.3%
Other materials & textiles & manufact.	1,150	0.7%
Food processing	733	0.5%
Other Architecture & construction	436	0.3%
Architecture & town planning	1,726	1.1%
Building & civil engineering	3,454	2.2%
Crop & livestock production	1,458	0.9%
Other agriculture forestry & fisheries	675	0.4%
Veterinary	559	0.4%
Dental studies & other health	963	0.6%
Medicine	2,683	1.7%
Nursing & midwifery	7,688	4.8%
Medical diagnostic & treatment tech.	1,278	0.8%
Therapy & rehabilitation	2,813	1.8%
Pharmacy	993	0.6%
Other welfare	481	0.3%
Child care & youth services	3,271	2.1%
Social work & counselling	3,469	2.2%
Hotel restaurants & catering	2,241	1.4%
Sports	1,890	1.2%
Travel tourism & leisure	1,592	1.0%
Occupational health & safety	514	0.3%
Security & transport services	530	0.3%

Variable	# Obs.	Percent
Research Masters	596	0.4%
PhD	2,137	1.3%
Total	158,688	100%
Final Degree Grade		
First Class	22,085	13.9%
Upper Second Class	72,840	45.9%
Lower Second Class	43,409	27.4%
Third Class	16,430	10.4%
Other	1,191	0.8%
Research Programme	2,733	1.7%
Total	158,688	100%
Gender		
Male	68,463	43.1%
Female	90,225	56.9%
Total	158,688	100%
County		
Dublin County	11,969	7.5%
Meath	6,486	4.1%
Louth	4,047	2.6%
Westmeath	3,366	2.1%
Longford	1,473	0.9%
Wicklow	4,581	2.9%
Wexford	4,863	3.1%
Kildare	7,053	4.4%
Carlow	1,891	1.2%
Offaly	2,612	1.6%
Laois	2,381	1.5%
Kilkenny	3,616	2.3%
Galway	10,042	6.3%
Mayo	5,555	3.5%
Sligo	2,646	1.7%
Leitrim	1,301	0.8%
Roscommon	2,673	1.7%
Donegal	4,724	3.0%
Cavan	2,653	1.7%
Monaghan	2,372	1.5%
Cork	20,247	12.8%
Kerry	5,933	3.7%
Limerick	6,992	4.4%
Clare	4,725	3.0%

Variable	# Obs.	Percent
Total	158,688	100%
Age at Entry to Higher Education		
17	7,317	7.6%
18	43,715	45.2%
19	36,538	37.8%
20	5,456	5.6%
21	1,100	1.1%
Missing	2,571	2.7%
Total	96,697	100%
Leaving Certificate Points		
155-200	1,134	1.2%
205-250	3,103	3.2%
255-300	7,165	7.4%
305-350	13,598	14.1%
355-400	18,801	19.4%
405-450	19,322	20.0%
455-500	15,465	16.0%
505-550	8,839	9.1%
555-600	3,980	4.1%
Other	1,174	1.2%
Missing	4,116	4.3%
Total	96,697	100%
Leaving Certificate Mathematics		
Higher A1	1,492	1.5%
Higher A2	1,741	1.8%
Higher B1	2,297	2.4%
Higher B2	2,826	2.9%
Higher B3	3,324	3.4%
Higher C1	3,358	3.5%
Higher C2	3,182	3.3%
Higher C3	2,592	2.7%
Higher D1	1,942	2.0%
Higher D2	1,244	1.3%
Higher D3	869	0.9%
Higher Fail	170	0.2%
Ordinary A1	3,775	3.9%
Ordinary A2	6,047	6.3%
Ordinary B1	7,724	8.0%
Ordinary B2	8,443	8.7%
Ordinary B3	8,126	8.4%

Variable	# Obs.	Percent
Tipperary	5,967	3.8%
Waterford	4,238	2.7%
Dublin 1	163	0.1%
Dublin 2	108	0.1%
Dublin 3	1,042	0.7%
Dublin 4	853	0.5%
Dublin 5	1,233	0.8%
Dublin 6	995	0.6%
Dublin 6W	1,163	0.7%
Dublin 7	904	0.6%
Dublin 8	432	0.3%
Dublin 9	1,439	0.9%
Dublin 10	201	0.1%
Dublin 11	919	0.6%
Dublin 12	979	0.6%
Dublin 13	1,035	0.7%
Dublin 14	1,902	1.2%
Dublin 15	2,621	1.7%
Dublin 16	2,478	1.6%
Dublin 17	196	0.1%
Dublin 18	1,784	1.1%
Dublin 20	359	0.2%
Dublin 22	748	0.5%
Dublin 24	1,571	1.0%
Unknown Dublin	1,053	0.7%
Unknown Ireland	104	0.1%
Total	158,688	100%
Leaving Certificate English		
Higher A1	3,685	3.8%
Higher A2	5,823	6.0%
Higher B1	4,905	5.1%
Higher B2	8,167	8.4%
Higher B3	10,901	11.3%
Higher C1	9,687	10.0%
Higher C2	10,531	10.9%
Higher C3	9,046	9.4%
Higher D1	5,621	5.8%
Higher D2	3,049	3.2%
Higher D3	1,635	1.7%
Higher Fail	95	0.1%

Variable	# Obs.	Percent
Ordinary C1	7,033	7.3%
Ordinary C2	5,898	6.1%
Ordinary C3	4,469	4.6%
Ordinary D1	2,989	3.1%
Ordinary D2	1,728	1.8%
Ordinary D3	1,239	1.3%
Ordinary Fail	267	0.3%
Missing	13,922	14.4%
Total	96,697	100%
Socio-Economic Group		
(A) Employers & Managers	13,054	13.5%
(B) Higher Professional	6,839	7.1%
(C) Lower Professional	6,195	6.4%
(D) Non-manual	6,559	6.8%
(E) Manual Skilled	7,676	7.9%
(F) Semi-skilled	3,736	3.9%
(G) Unskilled	2,040	2.1%
(H) Own Account Workers	5,238	5.4%
(I) Farmers	6,389	6.6%
(J) Agricultural Workers	406	0.4%
(Z) Other Occupied & Unknown	8,914	9.2%
Missing	29,651	30.7%
Total	96,697	100%
School Type		
DEIS	16,486	10.4%
Fee-Paying	16,729	10.5%
Missing	7,675	4.8%
Standard	117,798	74.2%
Total	158,688	100.0%
Deprivation Index Score of School ED		
Less than (or equal to) -10	24,527	15.5%
-10 to 0	47,477	29.9%
0 to 10	34,137	21.5%
Greater than 10	44,872	28.3%
Missing	7,675	4.8%
Total	158,688	100%

Variable	# Obs.	Percent
Ordinary A1	636	0.7%
Ordinary A2	1,432	1.5%
Ordinary B1	944	1.0%
Ordinary B2	1,694	1.8%
Ordinary B3	2,502	2.6%
Ordinary C1	1,182	1.2%
Ordinary C2	1,300	1.3%
Ordinary C3	894	0.9%
Ordinary D1	304	0.3%
Ordinary D2	173	0.2%
Ordinary D3	99	0.1%
Ordinary Fail	6	0.0%
Missing	12,386	12.8%
Total	96,697	100%
Mother Indicator		
No	68,104	96.2%
Yes	2,662	3.8%
Total	70,766	100%
Employment Sector		
Agriculture Forestry & Fishing (A)	572	0.8%
Industry (B-E)	6,162	8.7%
Construction (F)	1,278	1.8%
Wholesale & Retail (G)	7,063	10.0%
Transportation & Storage (H)	855	1.2%
Accommodation & Food Services (I)	2,453	3.5%
Information & Communication	5,356	7.6%
Finance & Real Estate (K-L)	7,190	10.2%
Professional Scientific & Technical (M)	10,478	14.8%
Administrative & Support Services (N)	4,097	5.8%
Public Administration & Defence (O)	2,992	4.2%
Education (P)	12,032	17.0%
Health & Social Work (Q)	8,321	11.8%
Other Activities (R-U)	1,767	2.5%
Missing	150	0.2%
Total	70,766	100%

Note: The number of observations for most student characteristics is 158,688 and refers to the `Earnings Sample' for all graduation cohorts (column 6 in Table A.2). The number of observations for age at entry to higher education, Leaving Certificate and socio-economic group information is 96,697 because this information is available for undergraduates only and refers to the 'Earnings Sample' for 2012 to 2017 undergraduate cohorts (column 1 in Table A.3). The number of observations for the mother indicator and employment sector is 70,766 because these are the only indicators which vary according to the year of employment and refers to those with substantial earnings four years after graduation (column 10 in Table A.2).

Appendix C: Multiple Graduations in Different Years

As previously shown in Table A.2, one-fifth of individuals have more than one graduation over different academic years. While the analysis in this paper is restricted to an individuals' latest graduation, this Appendix sheds further light on individuals' previous graduations with respect to their award types and field of study.

Table C.1 shows the relationship between previous and later award types for individuals' last two graduations. The vast majority of undergraduates obtain a higher level of award (these are illustrated in bold). For instance, 97 percent of Ordinary Degree graduates subsequently obtain an Honours Degree. 92 percent of Higher Degree graduates subsequently obtain a postgraduate qualification. Most postgraduates obtain another postgraduate qualification. For instance, 52 percent of PhD graduates obtain a further Postgraduate Diploma qualification while 25 percent obtain a Taught Masters.

Table C.1: Award Types for Multiple Graduations

	Latest Graduation							
Previous Graduation	Undergrad / Higher Diploma	Ordinary Degree	Honours Degree	Postgrad Diploma	Taught Masters	Research Masters	PhD	Total
Undergrad / Higher Diploma	**8%**	**55%**	**29%**	**3%**	**4%**	**0%**	**0%**	100%
Ordinary Degree	1%	**0%**	**97%**	**1%**	**1%**	**0%**	**0%**	100%
Honours Degree	3%	0%	5%	**18%**	**69%**	**2%**	**3%**	100%
Postgrad Diploma	4%	0%	1%	**29%**	**58%**	**2%**	**5%**	100%
Taught Masters	9%	1%	4%	44%	**29%**	**1%**	**12%**	100%
Research Masters	5%	1%	6%	29%	16%	**4%**	**40%**	100%
PhD	6%	0%	7%	52%	25%	0%	**9%**	100%

Note: The number of observations is 71,045 individuals who have a second graduation. This corresponds to the number of individuals with more than one graduation in Table A.2. This analysis is restricted to individuals' last two graduations.

Table C.2 shows the relationship between previous and later fields of study for individuals' last two graduations. The majority of graduates pursue further qualifications in later academic years in the same field of study. For instance, over 70 percent of Education, Business, ICT, Engineering Manufacturing & Construction, Agriculture and Health graduates obtain further a qualification in the same field.

Arts and Humanities and Social Sciences graduates are most likely to graduate with a second qualification in different a different field. One-quarter (26 percent) of Arts and Humanities graduates obtain a further qualification in Education, while 14 percent study Business, Administration and Law and 11 percent study Social Sciences.

Amongst Social Sciences graduates, nearly one-quarter (23 percent) receive a later qualification in Business, Administration and Law, while 12 percent graduate from Health & Welfare and 11 percent from Education.

Table C.2: Broad Fields of Study for Multiple Graduations

	Latest Graduation										
Previous Graduation	Education	Arts & Humanities	Social Sciences	Business, Admin. & Law	Sciences, Maths & Stats.	ICTs	Eng., Man. & Const.	Agriculture	Health & Welfare	Services	Total
Education	**71%**	9%	4%	5%	2%	2%	1%	0%	5%	1%	100%
Arts & Humanities	26%	**40%**	11%	14%	1%	4%	1%	0%	2%	0%	100%
Social Sciences	11%	7%	**40%**	23%	2%	4%	1%	0%	12%	1%	100%
Business, Admin. & Law	3%	1%	3%	**86%**	0%	4%	1%	0%	1%	1%	100%
Sciences, Maths & Stats.	8%	1%	1%	6%	**56%**	3%	10%	1%	13%	2%	100%
ICTs	1%	4%	1%	7%	2%	**82%**	1%	0%	0%	0%	100%
Eng., Man. & Const.	2%	1%	0%	7%	3%	4%	**79%**	0%	1%	2%	100%
Agriculture	4%	0%	0%	15%	9%	0%	3%	**68%**	1%	1%	100%
Health & Welfare	5%	2%	5%	4%	2%	1%	1%	0%	**78%**	2%	100%
Services	3%	1%	1%	24%	1%	1%	2%	0%	4%	**64%**	100%

Note: The number of observations is 71,045 individuals who have a second graduation. This corresponds to the number of individuals with more than one graduation in Table A.2. This analysis is restricted to individuals' last two graduations.

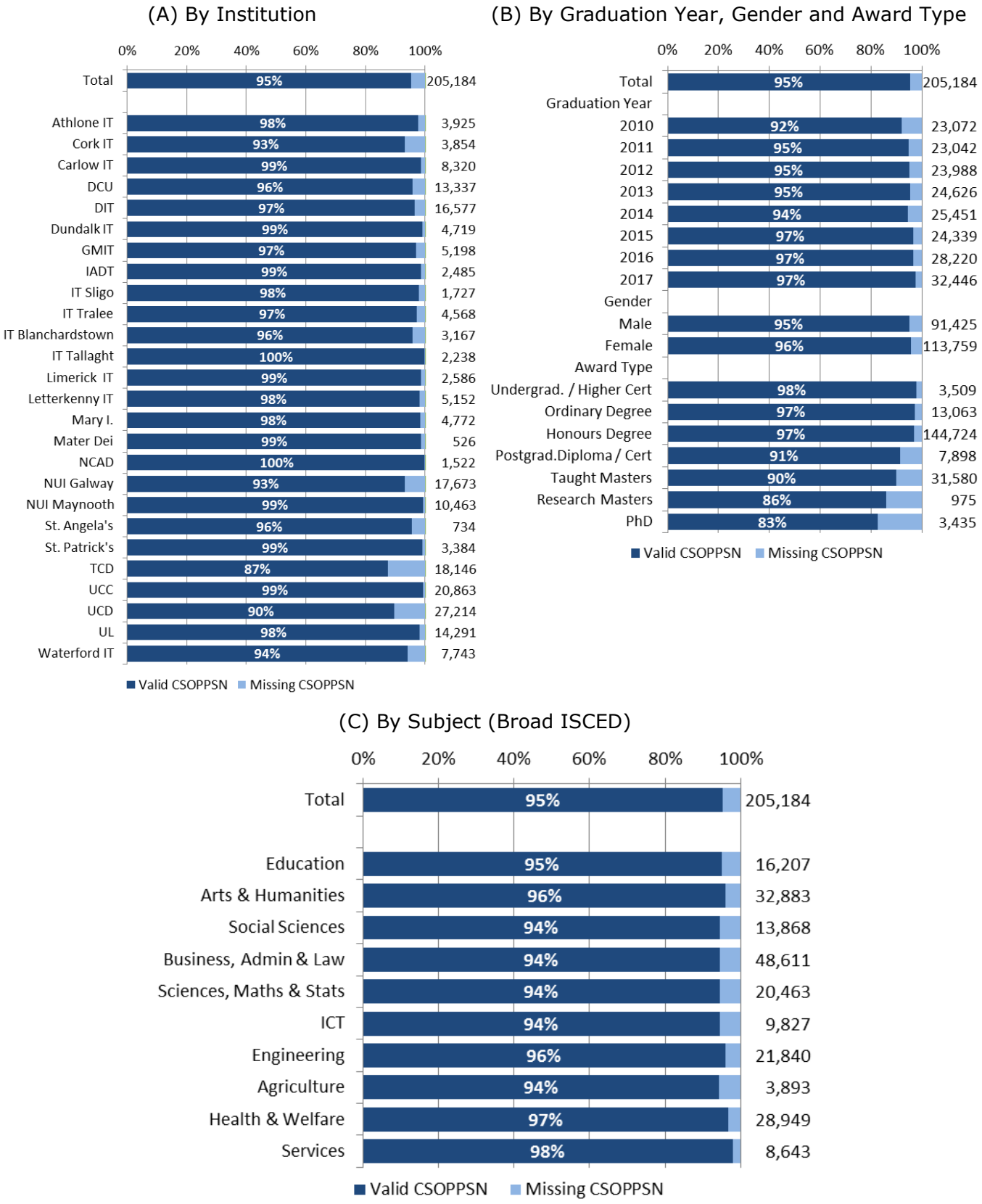
Appendix D: Graduates with Missing PPSN

CSOPPSN identifiers are missing for 5 percent of graduates from the HEA's records of young, full-time and Irish domiciled graduates (column 4 in Table A.2). Figure D.1 shows the rates of missing CSOPPSN across several key variables: institution, graduation year, gender, award type and field of study. Rates of missing CSOPPSN are broadly similar across gender and subject of study. Amongst institutions, TCD has the highest rate of missing identifiers (13 percent) followed by UCD (10 percent), Cork IT (7 percent) and NUI Galway (7 percent). Institutions with less than 1 percent missing graduate identifiers include Dundalk IT, IADT, Limerick IT, Mater Dei, NCAD, NUI Maynooth, St. Patrick's College and UCC.

CSOPPSN identifier coverage improves for more recent graduation cohorts. 8 percent of graduate records were returned with a missing identifier in 2010 while 3 percent were missing after 2015. Postgraduate courses have higher rates of missing identifiers. For instance, PPSN identifiers are missing for around 3 percent of undergraduate award types compared to missing identifiers for 14 percent and 17 percent of Research Masters and PhDs, respectively.

This analysis shows that rates of missing CSOPPSN are most prevalent across institution, award type and graduation cohort. To account for the non-random nature of missing CSOPPSN identifiers, post-stratification weights are applied for these three strata where the primary sampling units are the observed graduates.

Figure D.1: Rates of Missing CSOPPSN



Note: The number of observations is 205,184 young full-time individuals which correspond to the 'Young Full-Time' sample (column 4) in Table A.2. Full names for institutions are given in Table B.2.

Appendix E: Detailed Regression Results

Table E.1: Undergraduates Regression Results for Field of Study, 4 Years after Graduation

Subject	Subject	Institute	Degree	Demo-graphics	Pre-HE Attain	SEG	Mother
Pre-school teacher training & other	-34.17***	-31.72***	-31.77***	-31.06***	-29.07***	-29.06***	-28.33***
	(1.81)	(1.95)	(1.94)	(1.95)	(2.01)	(2.01)	(1.99)
Education science	-13.75***	-10.11***	-10.02***	-10.70***	-10.02***	-10.19***	-10.18***
	(1.65)	(2.21)	(2.15)	(2.14)	(2.15)	(2.15)	(2.14)
Teacher training without subject spec. (Reference)	-	-	-	-	-	-	-
Teacher training with subject spec.	-7.98***	-3.91**	-5.17***	-6.84***	-7.83***	-7.77***	-7.61***
	(1.01)	(1.57)	(1.56)	(1.54)	(1.53)	(1.54)	(1.54)
Other Arts	-27.26***	-21.76***	-20.08***	-20.80***	-19.71***	-19.67***	-19.65***
	(0.99)	(1.40)	(1.44)	(1.43)	(1.48)	(1.48)	(1.48)
Audio-visual & media production	-26.33***	-14.60***	-14.62***	-16.56***	-16.06***	-15.99***	-16.18***
	(1.29)	(1.75)	(1.74)	(1.71)	(1.74)	(1.75)	(1.74)
Fashion interior & industrial design	-24.23***	-10.01***	-10.42***	-11.29***	-11.09***	-11.14***	-11.09***
	(1.43)	(2.11)	(2.07)	(2.04)	(2.07)	(2.07)	(2.04)
Fine arts & handicrafts	-44.39***	-34.64***	-35.38***	-35.34***	-34.86***	-34.81***	-34.81***
	(1.30)	(1.76)	(1.75)	(1.75)	(1.78)	(1.78)	(1.78)
Music & performing arts	-38.63***	-32.00***	-32.23***	-33.40***	-32.83***	-32.72***	-32.96***
	(1.48)	(1.79)	(1.80)	(1.77)	(1.80)	(1.80)	(1.79)
Other humanities	-20.30***	-16.91***	-15.03***	-15.86***	-14.30***	-14.26***	-14.16***
	(0.98)	(1.15)	(1.18)	(1.17)	(1.23)	(1.23)	(1.23)
Religion & philosophy & history	-25.58***	-23.60***	-21.89***	-23.26***	-21.26***	-21.24***	-21.35***
	(1.64)	(1.87)	(1.91)	(1.87)	(1.94)	(1.94)	(1.94)
Languages	-25.26***	-22.61***	-20.61***	-21.45***	-19.79***	-19.73***	-19.71***
	(1.16)	(1.47)	(1.52)	(1.51)	(1.58)	(1.58)	(1.58)
Interdisciplinary Arts & Humanities	-16.68***	-13.13***	-10.80***	-11.23***	-9.05***	-8.99***	-8.88***
	(1.52)	(1.68)	(1.73)	(1.72)	(1.79)	(1.79)	(1.77)
Other social & behavioural sciences	-4.89**	-2.62	-2.15	-4.18**	-3.44*	-3.40*	-3.24
	(1.85)	(2.04)	(2.03)	(1.98)	(2.00)	(2.01)	(2.01)
Economics	-13.67***	-11.04***	-7.29**	-10.42***	-8.56***	-8.45***	-7.96***
	(2.52)	(2.75)	(2.81)	(2.68)	(2.75)	(2.75)	(2.71)
Political sciences & civics	-24.06***	-20.18***	-18.44***	-19.83***	-17.62***	-17.58***	-17.60***
	(2.52)	(2.78)	(2.86)	(2.80)	(2.90)	(2.91)	(2.91)
Psychology	-23.01***	-17.11***	-18.32***	-18.92***	-20.01***	-19.86***	-19.68***
	(1.83)	(2.20)	(2.18)	(2.16)	(2.14)	(2.14)	(2.15)
Sociology & cultural studies	-22.88***	-18.83***	-16.60***	-17.47***	-15.37***	-15.37***	-15.13***
	(1.30)	(1.62)	(1.66)	(1.64)	(1.72)	(1.71)	(1.71)
Journalism & information	-13.36***	-9.66***	-9.30***	-10.47***	-11.01***	-11.10***	-11.12***
	(2.23)	(2.57)	(2.58)	(2.52)	(2.56)	(2.55)	(2.53)
Other business & administration	-2.91***	5.48***	6.15***	3.81***	4.05***	4.04***	4.20***
	(0.68)	(1.35)	(1.36)	(1.35)	(1.38)	(1.39)	(1.39)
Accounting & taxation	-10.13***	5.78***	5.34***	3.33*	2.63	2.71	2.81*
	(1.19)	(1.80)	(1.75)	(1.73)	(1.74)	(1.74)	(1.73)
Finance banking & insurance	5.72***	14.08***	16.25***	12.22***	11.76***	11.74***	11.86***
	(2.21)	(2.65)	(2.55)	(2.47)	(2.44)	(2.45)	(2.43)
Management & administration	-17.17***	-2.55*	-2.21	-4.20***	-3.18**	-3.19**	-3.11**
	(0.75)	(1.42)	(1.41)	(1.39)	(1.45)	(1.45)	(1.44)
Marketing & advertising	-10.17***	3.48*	3.17*	1.07	2.12	2.04	2.12
	(1.25)	(1.87)	(1.84)	(1.80)	(1.86)	(1.86)	(1.85)
Secretarial retail & work skills	-13.55***	-2.60	2.84	1.67	2.91	2.66	2.63
	(2.42)	(2.83)	(2.90)	(2.89)	(2.95)	(2.94)	(2.90)
Law	-6.83***	1.10	0.21	-1.54	-2.75*	-2.68*	-2.47
	(1.17)	(1.58)	(1.55)	(1.54)	(1.54)	(1.54)	(1.53)
Other biological & related sciences	-5.39***	6.87***	7.11***	5.73**	4.75**	4.85**	4.85**
	(1.96)	(2.49)	(2.47)	(2.42)	(2.40)	(2.40)	(2.40)

Subject	Subject	Institute	Degree	Demo-graphics	Pre-HE Attain	SEG	Mother
Biology	-9.15***	-0.25	1.27	0.21	0.28	0.35	0.49
	(1.37)	(1.88)	(1.89)	(1.87)	(1.89)	(1.89)	(1.88)
Biochemistry	-2.15	9.06***	10.31***	8.95***	9.29***	9.54***	9.95***
	(2.12)	(2.69)	(2.70)	(2.68)	(2.72)	(2.72)	(2.74)
Environment	-13.40***	-1.70	-1.56	-3.92	-2.92	-2.87	-3.04
	(2.00)	(2.57)	(2.53)	(2.46)	(2.51)	(2.51)	(2.52)
Other earth & physical sciences	-17.22***	-12.67***	-11.90***	-13.42***	-14.04***	-14.06***	-13.99***
	(2.10)	(2.27)	(2.28)	(2.23)	(2.22)	(2.22)	(2.22)
Chemistry	8.62***	19.77***	22.09***	20.12***	20.38***	20.61***	20.67***
	(2.05)	(2.65)	(2.70)	(2.68)	(2.72)	(2.73)	(2.73)
Physics	1.61	8.16	9.64*	5.21	4.23	4.28	4.32
	(4.66)	(5.16)	(5.16)	(4.90)	(4.86)	(4.86)	(4.85)
Other Mathematics & Statistics	17.16***	22.71***	22.20***	18.81***	14.61***	14.68***	14.64***
	(2.89)	(3.34)	(3.21)	(3.15)	(3.05)	(3.05)	(3.05)
Statistics	60.83***	63.95***	56.64***	52.49***	41.22***	41.33***	41.42***
	(4.80)	(5.20)	(4.81)	(4.76)	(4.52)	(4.53)	(4.51)
Interdisc. Nat. Sci. Maths & Stats	-12.42***	-8.97***	-6.40***	-7.44***	-7.31***	-7.41***	-7.41***
	(1.86)	(2.15)	(2.20)	(2.16)	(2.17)	(2.17)	(2.17)
Other ICTs	12.52***	25.02***	26.00***	20.99***	22.64***	22.78***	22.58***
	(2.10)	(2.62)	(2.55)	(2.47)	(2.57)	(2.57)	(2.56)
Computer use	-2.95	12.04***	13.59***	9.27***	10.44***	10.58***	10.42***
	(2.29)	(2.83)	(2.75)	(2.64)	(2.70)	(2.72)	(2.70)
Database & network design & admin.	8.57***	24.75***	26.46***	20.93***	22.62***	22.77***	22.48***
	(2.68)	(3.20)	(3.10)	(2.97)	(3.08)	(3.09)	(3.08)
Software & applications development	4.35**	20.06***	20.85***	15.74***	17.36***	17.47***	17.31***
	(1.78)	(2.33)	(2.30)	(2.22)	(2.31)	(2.31)	(2.31)
Other engineering	11.22***	16.91***	18.80***	13.81***	12.76***	12.85***	12.81***
	(1.98)	(2.34)	(2.35)	(2.28)	(2.32)	(2.32)	(2.32)
Chemical engineering & processes	29.70***	38.91***	37.44***	33.54***	30.41***	30.65***	30.32***
	(2.73)	(3.26)	(3.16)	(3.10)	(3.07)	(3.07)	(3.06)
Electricity & energy	7.67***	23.10***	25.07***	19.09***	18.84***	18.87***	18.66***
	(2.21)	(2.92)	(2.90)	(2.80)	(2.84)	(2.84)	(2.83)
Electronics & automation	6.47***	22.56***	25.39***	19.69***	19.37***	19.58***	19.34***
	(1.97)	(2.62)	(2.59)	(2.50)	(2.53)	(2.53)	(2.53)
Mechanics & metal trades	0.65	14.82***	19.04***	13.22***	12.94***	13.12***	12.99***
	(1.34)	(2.00)	(2.03)	(1.98)	(2.02)	(2.02)	(2.02)
Motor vehicles ships & aircraft	-13.70***	0.30	9.28**	4.06	5.46	5.49	5.11
	(3.46)	(4.17)	(4.63)	(4.45)	(4.51)	(4.51)	(4.49)
Other materials & textiles & manufact.	-1.09	7.86***	9.93***	4.96**	5.78**	5.89**	5.97**
	(2.08)	(2.51)	(2.55)	(2.45)	(2.50)	(2.51)	(2.50)
Food processing	-2.99	6.96**	10.18***	9.01***	9.77***	9.86***	9.53***
	(3.16)	(3.53)	(3.38)	(3.29)	(3.30)	(3.30)	(3.24)
Other architecture & construction	-0.64	13.56***	12.33***	6.78**	5.10	5.14*	5.25*
	(2.76)	(3.40)	(3.34)	(3.19)	(3.20)	(3.20)	(3.21)
Architecture & town planning	-5.34***	4.11*	4.60**	1.59	1.15	1.26	1.50
	(1.66)	(2.16)	(2.17)	(2.11)	(2.14)	(2.14)	(2.14)
Building & civil engineering	-3.97***	13.41***	14.84***	9.26***	9.18***	9.29***	8.97***
	(1.07)	(1.81)	(1.81)	(1.76)	(1.81)	(1.82)	(1.81)
Crop & livestock production	-18.69***	-9.57***	-5.81***	-9.10***	-7.41***	-7.39***	-7.35***
	(1.56)	(2.03)	(2.09)	(2.03)	(2.11)	(2.10)	(2.10)
Other agriculture, fostery & fisheries	-19.98***	-13.04***	-10.39***	-13.13***	-11.21***	-11.21***	-11.33***
	(2.57)	(2.98)	(3.10)	(3.00)	(3.11)	(3.11)	(3.08)
Veterinary	-18.27***	-6.25**	-4.05	-3.87	-5.84**	-5.73**	-6.01**
	(2.36)	(2.65)	(2.77)	(2.77)	(2.62)	(2.63)	(2.60)
Other dental studies & health	-17.07***	-6.33*	-2.41	-3.38	-2.96	-2.95	-2.31
	(3.14)	(3.62)	(3.75)	(3.71)	(3.72)	(3.72)	(3.67)
Medicine	71.50***	77.91***	78.17***	76.69***	65.89***	65.77***	65.85***
	(1.71)	(2.66)	(2.91)	(2.97)	(3.21)	(3.21)	(3.19)
Nursing & midwifery	-0.24	9.14***	8.55***	8.92***	11.18***	11.17***	12.98***
	(0.74)	(1.40)	(1.39)	(1.41)	(1.50)	(1.50)	(1.52)

Subject	Subject	Institute	Degree	Demo-graphics	Pre-HE Attain	SEG	Mother
Medical diagnostic & treatment tech.	19.68***	31.00***	29.70***	28.34***	26.81***	26.93***	26.83***
	(2.11)	(2.70)	(2.67)	(2.64)	(2.62)	(2.62)	(2.59)
Therapy & rehabilitation	-8.15***	-3.31*	-3.45*	-3.63**	-6.17***	-6.17***	-6.01***
	(1.46)	(1.78)	(1.78)	(1.79)	(1.77)	(1.77)	(1.76)
Pharmacy	12.24***	21.28***	25.42***	25.00***	20.73***	20.73***	20.83***
	(2.74)	(3.03)	(3.08)	(3.07)	(3.00)	(3.00)	(3.01)
Other welfare	-23.22***	-4.96	-4.39	-3.91	-2.57	-2.62	-0.58
	(2.37)	(3.29)	(3.31)	(3.31)	(3.37)	(3.37)	(3.45)
Child care & youth services	-34.03***	-19.78***	-20.19***	-19.79***	-18.60***	-18.59***	-17.53***
	(0.78)	(1.36)	(1.36)	(1.37)	(1.42)	(1.42)	(1.42)
Social work & counselling	-17.42***	-1.71	-2.72	-2.46	-1.67	-1.68	-0.39
	(1.03)	(1.68)	(1.65)	(1.66)	(1.70)	(1.71)	(1.71)
Hotel restaurants & catering	-30.34***	-19.61***	-9.97***	-11.05***	-10.26***	-10.23***	-10.10***
	(0.88)	(1.39)	(1.63)	(1.61)	(1.66)	(1.66)	(1.65)
Sports	-29.85***	-11.87***	-9.44***	-12.34***	-11.85***	-11.82***	-12.16***
	(1.26)	(1.90)	(1.99)	(1.92)	(1.95)	(1.96)	(1.94)
Travel tourism & leisure	-26.57***	-14.37***	-9.44***	-10.35***	-9.73***	-9.69***	-9.30***
	(1.12)	(1.65)	(1.74)	(1.73)	(1.77)	(1.77)	(1.76)
Occupational health & safety	-2.39	11.57***	12.27***	10.87***	12.61***	12.81***	12.83***
	(2.71)	(3.42)	(3.42)	(3.36)	(3.45)	(3.45)	(3.41)
Security & transport services	-15.70***	-1.55	-0.85	-4.40	-3.13	-3.09	-2.96
	(2.75)	(3.30)	(3.30)	(3.14)	(3.20)	(3.20)	(3.13)
Observations	34,788	34,788	34,788	34,788	34,788	34,788	34,788
R-squared	0.197	0.234	0.258	0.266	0.271	0.272	0.281
Controls:							
Graduation Cohort	✓	✓	✓	✓	✓	✓	✓
Subject	✓	✓	✓	✓	✓	✓	✓
Institution		✓	✓	✓	✓	✓	✓
Award Type			✓	✓	✓	✓	✓
Final Degree Grade			✓	✓	✓	✓	✓
Gender				✓	✓	✓	✓
County of Origin				✓	✓	✓	✓
Age at Entry to HE				✓	✓	✓	✓
Leaving Certificate Points					✓	✓	✓
Leaving Certificate Maths					✓	✓	✓
Leaving Certificate English					✓	✓	✓
Second-Level School Type						✓	✓
School ED Deprivation Index						✓	✓
Socio-Economic Group						✓	✓
Mother							✓

Note: *, **, and *** denotes significance at the 10%, 5% and 1% level respectively. Coefficients and standard errors (in parentheses) show percentage differences in each subjects' earnings compared to Teacher Training without Subject Specialisation. The variables included in the set of controls are described further in Section 3.3 and Appendix B. The coefficients (and standard errors) have been transformed from log percentage points into percentage points using the transformation $100(e^b - 1)$ where b is the log percentage points coefficient. The delta method is used to transform the log point standard errors (se) to percentage points using the transformation $se \times 100(e^b)$.

Table E.2: Postgraduates Regression Results for Field of Study, 4 Years after Graduation

Subject	Subject	Institute	Degree	Demo-graphics	SEG	Mother
Pre-school teacher training & other	-8.21**	0.53	-10.73**	-10.00**	-10.23**	-10.08***
	(3.63)	(4.43)	(3.99)	(3.99)	(4.01)	(3.57)
Education science	-1.35	4.10*	0.96	1.50	1.54	1.59
	(1.26)	(2.33)	(2.22)	(2.20)	(2.20)	(2.16)
Teacher training without subject spec. (Reference)	-	-	-	-	-	-
Teacher training with subject spec.	-5.70***	9.28***	7.44***	7.71***	7.49***	7.64***
	(0.86)	(2.27)	(2.20)	(2.16)	(2.16)	(2.12)
Other arts	-20.57***	-8.68**	-21.64***	-21.48***	-21.79***	-22.10***
	(3.09)	(3.85)	(3.38)	(3.36)	(3.34)	(3.27)
Audio-visual & media production	-19.97***	-7.26**	-17.20***	-17.82***	-18.10***	-18.25***
	(2.16)	(3.13)	(2.90)	(2.86)	(2.85)	(2.83)
Fashion interior & industrial design	-4.44	12.52**	-2.56	-2.06	-2.05	-2.79
	(5.48)	(6.75)	(5.78)	(5.83)	(5.86)	(5.87)
Fine arts & handicrafts	-28.89***	-14.39***	-23.21***	-22.77***	-22.98***	-23.02***
	(3.43)	(4.45)	(4.02)	(4.05)	(4.03)	(4.01)
Music & performing arts	-33.11***	-22.59***	-31.75***	-31.59***	-31.85***	-32.04***
	(2.44)	(3.19)	(2.86)	(2.84)	(2.83)	(2.81)
Other humanities	-23.41***	-15.95***	-25.07***	-25.07***	-25.21***	-25.63***
	(3.45)	(3.99)	(3.72)	(3.69)	(3.68)	(3.66)
Religion & philosophy & history	-23.19***	-14.53***	-24.41***	-24.62***	-24.78***	-24.99***
	(1.57)	(2.31)	(2.14)	(2.12)	(2.11)	(2.08)
Languages	-23.02***	-13.03***	-22.55***	-22.52***	-22.67***	-22.85***
	(1.61)	(2.40)	(2.24)	(2.22)	(2.22)	(2.18)
Interdisciplinary Arts & Humanities	-14.55*	-6.57	-15.74*	-16.27*	-16.69*	-16.14*
	(7.37)	(8.16)	(7.99)	(8.10)	(7.97)	(7.67)
Other social & behavioural sciences	-12.36***	2.13	-9.73***	-9.18**	-9.28**	-8.89**
	(2.92)	(3.94)	(3.50)	(3.53)	(3.52)	(3.53)
Economics	0.66	16.92***	5.77*	4.63	4.20	4.00
	(2.24)	(3.41)	(3.16)	(3.09)	(3.08)	(3.04)
Political sciences & civics	-13.03***	-1.76	-12.70***	-13.14***	-13.45***	-13.73***
	(1.79)	(2.69)	(2.49)	(2.45)	(2.45)	(2.41)
Psychology	-7.13**	4.12	-10.70***	-10.48***	-10.75***	-10.82***
	(2.90)	(3.83)	(3.17)	(3.16)	(3.15)	(3.13)
Sociology & cultural studies	-19.20***	-9.21***	-18.50***	-18.40***	-18.63***	-18.61***
	(1.77)	(2.57)	(2.42)	(2.40)	(2.39)	(2.35)
Journalism & information	-17.22***	-7.57***	-17.85***	-18.14***	-18.35***	-18.56***
	(1.88)	(2.70)	(2.49)	(2.46)	(2.45)	(2.41)
Other business & administration	1.89	20.84***	11.79***	10.97***	10.44***	10.20***
	(1.70)	(2.91)	(2.67)	(2.61)	(2.60)	(2.56)
Accounting & taxation	24.60***	43.30***	30.68***	29.78***	29.03***	28.56***
	(1.32)	(2.99)	(2.89)	(2.82)	(2.81)	(2.75)
Finance banking & insurance	17.09***	31.15***	17.53***	15.65***	14.99***	14.83***
	(1.81)	(3.13)	(2.98)	(2.90)	(2.89)	(2.84)
Management & administration	4.66***	19.23***	6.38***	5.57**	5.01**	4.73**
	(1.19)	(2.55)	(2.46)	(2.41)	(2.40)	(2.35)
Marketing & advertising	4.59***	20.81***	6.64**	6.23**	5.60**	5.38**
	(1.43)	(2.81)	(2.68)	(2.64)	(2.62)	(2.58)
Secretarial retail & work skills	-6.23	9.66*	2.16	2.47	1.54	0.96
	(4.18)	(5.43)	(4.86)	(4.84)	(4.81)	(4.72)
Law	-10.77***	1.10	-9.29***	-9.41***	-9.82***	-10.15***
	(1.54)	(2.54)	(2.38)	(2.34)	(2.34)	(2.30)
Other biological & related sciences	4.00	20.56***	-1.53	-2.00	-2.27	-2.93
	(4.01)	(5.22)	(4.38)	(4.34)	(4.32)	(4.30)
Biology	5.39***	21.13***	-2.45	-2.36	-2.67	-2.96
	(2.08)	(3.31)	(2.92)	(2.90)	(2.89)	(2.86)
Biochemistry	1.26	13.02*	-6.92	-7.30	-7.72	-8.25
	(6.34)	(7.43)	(5.99)	(5.91)	(5.90)	(5.83)

Subject	Subject	Institute	Degree	Demo-graphics	SEG	Mother
Environment	-11.65***	-2.09	-12.45***	-12.91***	-13.21***	-13.41***
	(2.46)	(3.28)	(3.01)	(2.98)	(2.95)	(2.90)
Other earth & physical sciences	-6.40*	9.58**	-6.44	-6.88	-7.19*	-7.47*
	(3.55)	(4.89)	(4.22)	(4.15)	(4.13)	(4.10)
Chemistry	31.30***	46.23***	12.80***	12.51***	12.19***	11.84***
	(2.95)	(4.26)	(3.59)	(3.55)	(3.54)	(3.53)
Physics	33.47***	46.05***	11.43**	9.98**	9.79**	9.28**
	(4.88)	(5.97)	(4.83)	(4.75)	(4.74)	(4.75)
Other mathematics & statistics	3.72	16.83***	1.82	0.91	0.62	0.65
	(4.75)	(5.92)	(5.22)	(5.15)	(5.11)	(5.01)
Statistics	22.01***	30.78***	21.02***	19.14***	18.77***	18.45***
	(5.13)	(5.99)	(5.29)	(5.17)	(5.15)	(5.11)
Interdisc. Nat. Sci. Maths & Stats	20.42***	43.10***	9.69*	9.26*	8.69*	9.05*
	(4.90)	(6.47)	(5.39)	(5.30)	(5.22)	(5.41)
Other ICTs	14.38***	31.49***	16.76***	14.83***	14.43***	14.25***
	(1.90)	(3.22)	(2.95)	(2.87)	(2.86)	(2.82)
Computer use	-2.41	19.62***	17.79***	16.63***	16.24***	15.63***
	(5.16)	(6.66)	(6.39)	(6.10)	(6.08)	(6.08)
Database & network design & admin.	13.88***	32.64***	19.85***	17.76***	17.65***	17.60***
	(2.09)	(3.53)	(3.30)	(3.21)	(3.21)	(3.17)
Software & applications development	17.18***	37.33***	26.44***	24.63***	24.33***	24.24***
	(3.01)	(4.23)	(3.91)	(3.82)	(3.82)	(3.78)
Other engineering	23.95***	37.59***	12.56***	10.84***	10.40***	9.92***
	(2.27)	(3.59)	(3.16)	(3.10)	(3.09)	(3.04)
Chemical engineering & processes	19.68***	34.27***	18.80***	17.49***	17.38***	17.26***
	(2.82)	(3.97)	(3.65)	(3.59)	(3.58)	(3.52)
Electricity & energy	9.43***	26.64***	11.15**	9.20**	8.90**	8.68**
	(3.76)	(5.02)	(4.69)	(4.64)	(4.62)	(4.60)
Electronics & automation	29.48***	50.60***	28.83***	26.48***	26.04***	25.39***
	(3.51)	(4.88)	(4.15)	(4.06)	(4.05)	(3.99)
Mechanics & metal trades	24.74***	41.12***	17.52***	14.84**	14.02**	13.38**
	(7.09)	(8.57)	(6.76)	(6.63)	(6.56)	(6.46)
Motor vehicles ships & aircraft	-1.42	13.26	-2.23	-2.28	-2.57	-2.90
	(24.39)	(28.11)	(27.39)	(26.47)	(26.78)	(26.60)
Other materials & textiles & manufact.	11.39***	32.73***	21.43***	19.36***	18.89***	18.40***
	(3.27)	(4.68)	(4.39)	(4.32)	(4.31)	(4.27)
Food processing	-12.82**	-1.74	-14.82***	-14.17***	-14.16***	-14.53***
	(4.88)	(5.74)	(4.90)	(4.86)	(4.86)	(4.69)
Other architecture & construction	10.66	32.25***	12.99*	10.81	10.63	10.40
	(8.35)	(10.07)	(8.12)	(7.88)	(7.82)	(7.75)
Architecture & town planning	-11.95***	-1.37	-11.56***	-11.94***	-12.41***	-12.57***
	(3.00)	(3.85)	(3.57)	(3.53)	(3.52)	(3.49)
Building & civil engineering	8.63***	21.14***	5.12	3.68	3.38	2.87
	(2.66)	(3.77)	(3.33)	(3.29)	(3.29)	(3.24)
Crop & livestock production	-2.12	2.37	-20.36*	-20.48*	-20.90*	-20.87**
	(11.55)	(12.21)	(10.01)	(9.77)	(9.67)	(8.98)
Other agriculture, fostery & fisheries	7.04*	11.84***	-6.55*	-7.21*	-7.30*	-7.79**
	(3.79)	(4.42)	(3.78)	(3.77)	(3.79)	(3.74)
Veterinary	-9.74	-5.92	-27.99**	-28.16**	-28.19**	-24.31*
	(15.06)	(15.81)	(11.05)	(10.89)	(10.82)	(12.08)
Other dental studies & health	-8.56	1.26	-11.91**	-11.66**	-12.01**	-12.47**
	(5.53)	(6.25)	(5.53)	(5.51)	(5.53)	(5.50)
Medicine	5.22*	15.65***	-2.40	-2.11	-2.42	-2.55
	(2.94)	(3.85)	(3.30)	(3.25)	(3.25)	(3.20)
Nursing & midwifery	12.40***	24.96***	25.36***	26.53***	26.41***	30.40***
	(2.58)	(3.73)	(3.70)	(3.71)	(3.72)	(3.75)
Medical diagnostic & treatment tech.	14.22**	33.80***	22.59***	21.93***	21.71***	21.42***
	(7.06)	(8.84)	(7.87)	(7.82)	(7.80)	(7.68)
Therapy & rehabilitation	0.30	11.80***	-4.88	-4.15	-4.50	-4.01
	(2.46)	(3.45)	(3.00)	(3.02)	(3.01)	(2.96)

Subject	Subject	Institute	Degree	Demo-graphics	SEG	Mother
Pharmacy	33.37***	42.16***	15.57**	15.61**	15.30**	17.36**
	(8.63)	(9.84)	(8.02)	(7.68)	(7.68)	(7.96)
Other welfare	-28.79***	-15.42*	-19.21**	-18.28**	-18.36**	-16.43*
	(7.32)	(8.46)	(7.58)	(7.80)	(7.75)	(8.30)
Child care & youth services	-27.91***	-2.49	-8.51	-7.53	-7.91	-6.42
	(6.04)	(8.68)	(8.25)	(8.41)	(8.41)	(8.75)
Social work & counselling	3.10*	14.83***	5.46**	6.68**	6.61**	7.85***
	(1.75)	(2.90)	(2.84)	(2.87)	(2.88)	(2.90)
Hotel restaurants & catering	-12.88**	1.73	-8.62	-9.04	-9.91	-10.61
	(6.07)	(7.38)	(7.04)	(7.35)	(7.20)	(7.16)
Sports	-12.30	2.20	-10.84	-12.15	-12.28	-12.89*
	(7.31)	(8.46)	(7.07)	(6.96)	(7.05)	(7.00)
Travel tourism & leisure	-30.92***	-15.76***	-23.25***	-23.07***	-23.27***	-22.79***
	(4.39)	(5.40)	(5.02)	(5.02)	(5.00)	(4.93)
Occupational health & safety	6.86**	29.80***	18.97***	19.00***	18.75***	19.22***
	(3.33)	(4.97)	(4.68)	(4.57)	(4.56)	(4.53)
Observations	16,731	16,731	16,731	16,731	16,731	16,731
R-squared	0.172	0.206	0.235	0.241	0.242	0.248
Controls:						
Graduation Cohort	✓	✓	✓	✓	✓	✓
Subject	✓	✓	✓	✓	✓	✓
Institution		✓	✓	✓	✓	✓
Award Type			✓	✓	✓	✓
Final Degree Grade			✓	✓	✓	✓
Gender				✓	✓	✓
County of Origin				✓	✓	✓
Second-Level School Type					✓	✓
School ED Deprivation Index					✓	✓
Mother						✓

Note: *, **, and *** denotes significance at the 10%, 5% and 1% level respectively. Coefficients and standard errors (in parentheses) show percentage differences in each subjects' earnings compared to Teacher Training without Subject Specialisation. The variables included in the set of controls are described further in Section 3.3 and Appendix B. The coefficients (and standard errors) have been transformed from log percentage points into percentage points using the transformation $100(e^b - 1)$ where *b* is the log percentage points coefficient. The delta method is used to transform the log point standard errors (*se*) to percentage points using the transformation $se \times 100(e^b)$.

Table E.3: Undergraduates Regression Results for Institution Type, 4 Years after Graduation

Institution Type	Base	Subject	Degree	Demo-graphics	Pre-HE Attain	SEG	Mother	Sector
University (Reference)	-	-	-	-	-	-	-	-
College	-4.00***	-0.52	0.72	2.04**	2.01**	2.04**	1.94**	2.36**
	(0.56)	(0.93)	(0.94)	(0.96)	(0.97)	(0.97)	(0.97)	(0.95)
Institute of Technology	-13.95***	-12.98***	-9.29***	-8.59***	-4.99***	-4.92***	-4.74***	-4.23***
	(0.38)	(0.46)	(0.48)	(0.49)	(0.58)	(0.58)	(0.58)	(0.56)
Observations	34,788	34,788	34,788	34,788	34,788	34,788	34,788	34,788
R-squared	0.039	0.214	0.243	0.258	0.265	0.266	0.275	0.330
Controls:								
Graduation Cohort	✓	✓	✓	✓	✓	✓	✓	✓
Institution Type	✓	✓	✓	✓	✓	✓	✓	✓
Subject		✓	✓	✓	✓	✓	✓	✓
Award Type			✓	✓	✓	✓	✓	✓
Final Degree Grade			✓	✓	✓	✓	✓	✓
Gender				✓	✓	✓	✓	✓
County of Origin				✓	✓	✓	✓	✓
Age at Entry to HE				✓	✓	✓	✓	✓
Leaving Certificate Points					✓	✓	✓	✓
Leaving Certificate Maths					✓	✓	✓	✓
Leaving Certificate English					✓	✓	✓	✓
Second-Level School Type						✓	✓	✓
School ED Deprivation Index						✓	✓	✓
Socio-Economic Group						✓	✓	✓
Mother							✓	✓
Sector of Employment								✓

Note: *, **, and *** denotes significance at the 10%, 5% and 1% level respectively. Coefficients and standard errors (in parentheses) show percentage differences in each institution types' earnings compared to Universities. The variables included in the set of controls are described further in Section 3.3 and Appendix B. The coefficients (and standard errors) have been transformed from log percentage points into percentage points using the transformation $100(e^b - 1)$ where b is the log percentage points coefficient. The delta method is used to transform the log point standard errors (se) to percentage points using the transformation $se \times 100(e^b)$.

Table E.4: Postgraduates Regression Results for Institution Type, 4 Years after Graduation

Institution Type	Base	Subject	Degree	Demo-graphics	SEG	Mother	Sector
University (Reference)	-	-	-	-	-	-	-
College	-4.11***	1.76	1.18	2.87	2.79	2.91*	3.75**
	(0.95)	(1.79)	(1.76)	(1.81)	(1.81)	(1.79)	(1.77)
Institute of Technology	-5.52***	-10.91***	-9.86***	-10.05***	-9.87***	-9.70***	-9.27***
	(0.75)	(0.75)	(0.76)	(0.76)	(0.76)	(0.76)	(0.75)
Observations	16,731	16,731	16,731	16,731	16,731	16,731	16,731
R-squared	0.012	0.181	0.211	0.223	0.225	0.231	0.277
Controls:							
Graduation Cohort	✓	✓	✓	✓	✓	✓	✓
Institution Type	✓	✓	✓	✓	✓	✓	✓
Subject		✓	✓	✓	✓	✓	✓
Award Type			✓	✓	✓	✓	✓
Final Degree Grade			✓	✓	✓	✓	✓
Gender				✓	✓	✓	✓
County of Origin				✓	✓	✓	✓
Second-Level School Type					✓	✓	✓
School ED Deprivation Index					✓	✓	✓
Mother						✓	✓
Sector of Employment							✓

Note: *, **, and *** denotes significance at the 10%, 5% and 1% level respectively. Coefficients and standard errors (in parentheses) show percentage differences in each institution types' earnings compared to Universities. The variables included in the set of controls are described further in Section 3.3 and Appendix B. The coefficients (and standard errors) have been transformed from log percentage points into percentage points using the transformation $100(e^b - 1)$ where b is the log percentage points coefficient. The delta method is used to transform the log point standard errors (se) to percentage points using the transformation $se \times 100(e^b)$.

Table E.5: Undergraduates Regression Results for Gender, 4 Years after Graduation

Gender	Base	Institute	Course	Degree	Demo-graphics	Pre-HE Attain	SEG	Mother	Sector
Male (Reference)	-	-	-	-	-	-	-	-	-
Female	-8.86***	-9.39***	-3.82***	-4.52***	-4.44***	-4.48***	-4.47***	-3.48***	-2.92***
	(0.39)	(0.38)	(0.44)	(0.43)	(0.43)	(0.44)	(0.44)	(0.44)	(0.43)
Observations	34,788	34,788	34,788	34,788	34,788	34,788	34,788	34,788	34,788
Adjusted R-squared	0.019	0.086	0.305	0.315	0.316	0.317	0.318	0.326	0.373
Controls:									
Graduation Cohort	✓	✓	✓	✓	✓	✓	✓	✓	✓
Institution		✓	✓	✓	✓	✓	✓	✓	✓
Course Name			✓	✓	✓	✓	✓	✓	✓
Award Type				✓	✓	✓	✓	✓	✓
Final Degree Grade				✓	✓	✓	✓	✓	✓
Gender	✓	✓	✓	✓	✓	✓	✓	✓	✓
County of Origin					✓	✓	✓	✓	✓
Age at Entry to HE					✓	✓	✓	✓	✓
Leaving Certificate Points						✓	✓	✓	✓
Leaving Certificate Maths						✓	✓	✓	✓
Leaving Certificate English						✓	✓	✓	✓
Second-Level School Type							✓	✓	✓
School ED Deprivation Index							✓	✓	✓
Socio-Economic Group							✓	✓	✓
Mother								✓	✓
Sector of Employment									✓

Note: *, **, and *** denotes significance at the 10%, 5% and 1% level respectively. Coefficients and standard errors (in parentheses) show percentage differences in females' earnings compared to males. The variables included in the set of controls are described further in Section 3.3 and Appendix B. The coefficients (and standard errors) have been transformed from log percentage points into percentage points using the transformation $100(e^b - 1)$ where b is the log percentage points coefficient. The delta method is used to transform the log point standard errors (se) to percentage points using the transformation $se \times 100(e^b)$.

Table E.6: Postgraduates Regression Results for Gender, 4 Years after Graduation

Gender	Base	Institute	Course	Degree	Demo-graphics	SEG	Mother	Sector
Male (Reference)	-	-	-	-	-	-	-	-
Female	-7.62***	-7.08***	-1.59***	-2.24***	-2.21***	-2.18***	-1.25**	-0.71
	(0.53)	(0.53)	(0.58)	(0.57)	(0.58)	(0.58)	(0.58)	(0.57)
Observations	16,731	16,731	16,731	16,731	16,731	16,731	16,731	16,731
Adjusted R-squared	0.020	0.057	0.276	0.290	0.290	0.291	0.297	0.337
Controls:								
Graduation Cohort	✓	✓	✓	✓	✓	✓	✓	✓
Institution		✓	✓	✓	✓	✓	✓	✓
Course Name			✓	✓	✓	✓	✓	✓
Award Type				✓	✓	✓	✓	✓
Final Degree Grade				✓	✓	✓	✓	✓
Gender	✓	✓	✓	✓	✓	✓	✓	✓
County of Origin					✓	✓	✓	✓
Second-Level School Type						✓	✓	✓
School ED Deprivation Index						✓	✓	✓
Mother							✓	✓
Sector of Employment								✓

Note: *, **, and *** denotes significance at the 10%, 5% and 1% level respectively. Coefficients and standard errors (in parentheses) show percentage differences in females' earnings compared to males. The variables included in the set of controls are described further in Section 3.3 and Appendix B. The coefficients (and standard errors) have been transformed from log percentage points into percentage points using the transformation $100(e^b - 1)$ where b is the log percentage points coefficient. The delta method is used to transform the log point standard errors (se) to percentage points using the transformation $se \times 100(e^b)$.

Table E.7: Undergraduates Regression Results for Second-Level School Type, 4 Years after Graduation

Second-Level School Type	Base	Institute	Course	Degree	Demo-graphics	Pre-HE	SEG	Mother	Sector
Standard (Reference)	-	-	-	-	-	-	-	-	-
DEIS	-5.95***	-3.37***	-2.58***	-2.52***	-2.46***	-2.25***	-2.31***	-2.11***	-1.88***
	(0.65)	(0.66)	(0.60)	(0.59)	(0.62)	(0.60)	(0.63)	(0.63)	(0.60)
Fee-Paying	9.32***	3.56***	1.71**	1.76**	0.37	0.30	0.43	0.38	0.76
	(0.86)	(0.84)	(0.76)	(0.75)	(0.79)	(0.73)	(0.80)	(0.80)	(0.77)
Missing	-2.08	-1.17	-1.26	-1.55	-1.42	-1.24	-1.52	-1.26	-1.34
	(1.42)	(1.38)	(1.30)	(1.28)	(1.29)	(1.17)	(1.33)	(1.32)	(1.26)
Observations	34,788	34,788	34,788	34,788	34,788	34,788	34,788	34,788	34,788
Adjusted R-squared	0.013	0.073	0.304	0.313	0.317	0.317	0.318	0.326	0.373
Controls:									
Graduation Cohort	✓	✓	✓	✓	✓	✓	✓	✓	✓
Institution		✓	✓	✓	✓	✓	✓	✓	✓
Course Name			✓	✓	✓	✓	✓	✓	✓
Award Type				✓	✓	✓	✓	✓	✓
Final Degree Grade				✓	✓	✓	✓	✓	✓
Gender					✓	✓	✓	✓	✓
County of Origin					✓	✓	✓	✓	✓
Age at Entry to HE					✓	✓	✓	✓	✓
Leaving Certificate Points						✓	✓	✓	✓
Leaving Certificate Maths						✓	✓	✓	✓
Leaving Certificate English						✓	✓	✓	✓
Second-Level School Type	✓	✓	✓	✓	✓	✓	✓	✓	✓
School ED Deprivation Index							✓	✓	✓
Socio-Economic Group							✓	✓	✓
Mother								✓	✓
Sector of Employment									✓

Note: *, **, and *** denotes significance at the 10%, 5% and 1% level respectively. Coefficients and standard errors (in parentheses) show percentage differences in each school types' earnings compared to standard schools. The variables included in the set of controls are described further in Section 3.3 and Appendix B. The coefficients (and standard errors) have been transformed from log percentage points into percentage points using the transformation $100(e^b - 1)$ where *b* is the log percentage points coefficient. The delta method is used to transform the log point standard errors (*se*) to percentage points using the transformation $se \times 100(e^b)$.

Table E.8: Postgraduates Regression Results for Second-Level School Type, 4 Years after Graduation

Second-Level School Type	Base	Institute	Course	Degree	Demo-graphics	SEG	Mother	Sector
Standard (Reference)	-	-	-	-	-	-	-	-
DEIS	-2.52**	-2.61**	-1.62*	-1.51	-1.25	-1.29	-1.21	-0.82
	(1.01)	(1.00)	(0.92)	(0.92)	(0.95)	(0.97)	(0.96)	(0.93)
Fee-Paying	11.32***	6.75***	2.94***	3.25***	3.00***	3.08***	3.10***	2.68***
	(1.04)	(1.01)	(0.93)	(0.93)	(0.99)	(0.99)	(0.99)	(0.96)
Missing	6.70***	5.44***	-0.13	-0.51	-0.65	0.26	0.84	0.85
	(0.96)	(0.95)	(0.91)	(0.90)	(0.90)	(1.06)	(1.06)	(1.02)
Observations	16,731	16,731	16,731	16,731	16,731	16,731	16,731	16,731
Adjusted R-squared	0.020	0.052	0.276	0.290	0.290	0.291	0.297	0.337
Controls:								
Graduation Cohort	✓	✓	✓	✓	✓	✓	✓	✓
Institution		✓	✓	✓	✓	✓	✓	✓
Course Name			✓	✓	✓	✓	✓	✓
Award Type				✓	✓	✓	✓	✓
Final Degree Grade				✓	✓	✓	✓	✓
Gender					✓	✓	✓	✓
County of Origin					✓	✓	✓	✓
Second-Level School Type	✓	✓	✓	✓	✓	✓	✓	✓
School ED Deprivation Index						✓	✓	✓
Mother							✓	✓
Sector of Employment								✓

Note: *, **, and *** denotes significance at the 10%, 5% and 1% level respectively. Coefficients and standard errors (in parentheses) show percentage differences in each school types' earnings compared to standard schools. The variables included in the set of controls are described further in Section 3.3 and Appendix B. The coefficients (and standard errors) have been transformed from log percentage points into percentage points using the transformation $100(e^b - 1)$ where *b* is the log percentage points coefficient. The delta method is used to transform the log point standard errors (*se*) to percentage points using the transformation $se \times 100(e^b)$.

Table E.9: Undergraduate Regression Results Over Time for Gender and Second-Level School Type

	Excluding New Entrant Info.			Including New Entrant Info.		
	Gender	School Type	Full Model	Gender	School Type	Full Model
1 Year After Graduation						
Male (Reference)	-		-	-		-
Female	-3.55***		-1.96***	-4.63***		-1.89***
	(0.25)		(0.23)	(0.27)		(0.26)
Standard (Reference)		-	-		-	-
DEIS		-4.19***	-0.09		-3.83***	-0.10
		(0.39)	(0.33)		(0.42)	(0.36)
Fee-Paying		0.05	-1.74***		0.06	-2.05***
		(0.46)	(0.41)		(0.51)	(0.45)
Missing		0.15	0.74		-1.18	-0.13
		(0.80)	(0.65)		(0.89)	(0.74)
Observations	103,683	103,683	103,683	83,282	83,282	83,282
Adjusted R-squared	0.019	0.018	0.466	0.023	0.021	0.465
2 Years After Graduation						
Male (Reference)	-		-	-		-
Female	-4.12***		-1.88***	-5.24***		-1.71***
	(0.27)		(0.26)	(0.29)		(0.30)
Standard (Reference)		-	-		-	-
DEIS		-4.44***	-0.22		-4.12***	-0.40
		(0.42)	(0.37)		(0.46)	(0.41)
Fee-Paying		4.00***	-0.49		4.02***	-0.46
		(0.51)	(0.46)		(0.58)	(0.52)
Missing		0.87	0.92		-1.14	-0.20
		(0.87)	(0.72)		(1.00)	(0.86)
Observations	83,145	83,145	83,145	63,522	63,522	63,522
Adjusted R-squared	0.018	0.017	0.422	0.019	0.016	0.413
3 Years After Graduation						
Male (Reference)	-		-	-		-
Female	-5.81***		-2.40***	-6.91***		-2.18***
	(0.29)		(0.30)	(0.33)		(0.35)
Standard (Reference)		-	-		-	-
DEIS		-5.41***	-1.11***		-5.37***	-1.56***
		(0.47)	(0.42)		(0.54)	(0.49)
Fee-Paying		6.33***	-0.18		6.02***	-0.15
		(0.58)	(0.53)		(0.68)	(0.62)
Missing		1.80*	1.85**		-1.37	-0.01
		(0.97)	(0.81)		(1.14)	(1.00)
Observations	67,360	67,360	67,360	48,108	48,108	48,108
Adjusted R-squared	0.018	0.017	0.397	0.018	0.014	0.389

	Excluding New Entrant Info.			Including New Entrant Info.		
	Gender	School Type	Full Model	Gender	School Type	Full Model
4 Years After Graduation						
Male (Reference)	-		-	-		-
Female	-7.70***		-2.93***	-8.86***		-2.92***
	(0.32)		(0.35)	(0.39)		(0.43)
Standard (Reference)		-	-		-	-
DEIS		-5.39***	-1.14**		-5.95***	-1.88***
		(0.53)	(0.48)		(0.65)	(0.60)
Fee-Paying		10.12***	1.11*		9.32***	0.76
		(0.70)	(0.62)		(0.86)	(0.77)
Missing		2.24**	1.33		-2.08	-1.34
		(1.11)	(0.94)		(1.42)	(1.26)
Observations	54,035	54,035	54,035	34,788	34,788	34,788
Adjusted R-squared	0.021	0.019	0.382	0.019	0.013	0.373
5 Years After Graduation						
Male (Reference)	-		-	-		-
Female	-8.72***		-3.06***	-9.45***		-2.77***
	(0.38)		(0.42)	(0.51)		(0.57)
Standard (Reference)		-	-		-	-
DEIS		-5.72***	-1.73***		-5.68***	-1.71**
		(0.62)	(0.56)		(0.83)	(0.77)
Fee-Paying		13.53***	2.27***		13.24***	3.30***
		(0.86)	(0.74)		(1.16)	(1.02)
Missing		1.85	0.96		-2.91	-1.22
		(1.31)	(1.14)		(2.00)	(1.80)
Observations	41,323	41,323	41,323	22,207	22,207	22,207
Adjusted R-squared	0.017	0.017	0.384	0.016	0.012	0.378
6 Years After Graduation						
Male (Reference)	-		-	-		-
Female	-9.81***		-2.94***	-11.38***		-2.94***
	(0.45)		(0.51)	(0.71)		(0.85)
Standard (Reference)		-	-		-	-
DEIS		-6.62***	-2.10***		-6.10***	-1.70
		(0.74)	(0.68)		(1.20)	(1.17)
Fee-Paying		14.65***	1.43		13.79***	3.69**
		(1.07)	(0.92)		(1.73)	(1.57)
Missing		2.56*	1.93		-3.59	-0.79
		(1.56)	(1.35)		(3.15)	(2.88)
Observations	30,023	30,023	30,023	10,960	10,960	10,960
Adjusted R-squared	0.017	0.016	0.382	0.020	0.011	0.392

	Excluding New Entrant Info.			Including New Entrant Info.		
	Gender	School Type	Full Model	Gender	School Type	Full Model
7 Years After Graduation						
Male (Reference)	-		-			
Female	-10.96***		-3.19***			
	(0.58)		(0.68)			
Standard (Reference)		-	-			
DEIS		-5.31***	-0.56			
		(0.97)	(0.91)			
Fee-Paying		17.92***	0.79			
		(1.45)	(1.18)			
Missing		3.05*	1.57			
		(1.83)	(1.60)			
Observations	19,157	19,157	19,157			
Adjusted R-squared	0.019	0.016	0.386			
8 Years After Graduation						
Male (Reference)	-		-			
Female	-13.82***		-2.21**			
	(0.83)		(1.06)			
Standard (Reference)		-	-			
DEIS		-4.78***	0.67			
		(1.52)	(1.49)			
Fee-Paying		16.99***	0.74			
		(2.16)	(1.82)			
Missing		1.72	-2.70			
		(2.37)	(2.16)			
Observations	9,387	9,387	9,387			
Adjusted R-squared	0.025	0.012	0.372			
Controls:						
Graduation Cohort	✓	✓	✓	✓	✓	✓
Institution			✓			✓
Course Name			✓			✓
Award Type			✓			✓
Final Degree Grade			✓			✓
Gender	✓		✓	✓		✓
County of Origin			✓			✓
Age at Entry to HE						✓
Leaving Certificate Points						✓
Leaving Certificate Maths						✓
Leaving Certificate English						✓
Second-Level School Type		✓	✓		✓	✓
School ED Deprivation Index			✓			✓
Socio-Economic Group						✓
Mother			✓			✓
Sector of Employment			✓			✓

Note: *, **, and *** denotes significance at the 10%, 5% and 1% level respectively. Coefficients and standard errors (in parentheses) show percentage differences in females' earnings compared to males and percentage differences in each school types' earnings compared to standard schools. Models excluding new entrant information are estimated for graduation cohorts from 2010 to 2017 and the number of observations relate to the 'Total' in each respective year after graduation in Table A.3. Models including new entrant information are estimated for graduation cohorts from 2012 to 2017 and the number of observations relate to the 'NE total' in each respective year after graduation in Table A.3. The variables included in the set of controls are described further in Section 3.3 and Appendix B. The coefficients (and standard errors) have been transformed from log percentage points into percentage points using the transformation $100(e^b - 1)$ where *b* is the log percentage points coefficient. The delta method is used to transform the log point standard errors (*se*) to percentage points using the transformation $se \times 100(e^b)$.

Table E.10: Postgraduate Regression Results Over Time for Gender and Second-Level School Type

	Excluding New Entrant Info.		
	Gender	School Type	Full Model
1 Year After Graduation			
Male (Reference)	-		-
Female	-1.39***		-0.36
	(0.42)		(0.40)
Standard (Reference)		-	-
DEIS		-0.15	0.07
		(0.79)	(0.69)
Fee-Paying		1.85***	1.14*
		(0.62)	(0.63)
Missing		14.01***	3.34***
		(0.89)	(0.82)
Observations	29,030	29,030	29,030
Adjusted R-squared	0.023	0.034	0.394
2 Years After Graduation			
Male (Reference)	-		-
Female	-3.34***		-0.59
	(0.43)		(0.43)
Standard (Reference)		-	-
DEIS		-1.64**	-0.69
		(0.81)	(0.74)
Fee-Paying		3.92***	0.95
		(0.66)	(0.67)
Missing		11.90***	2.81***
		(0.88)	(0.85)
Observations	24,256	24,256	24,256
Adjusted R-squared	0.020	0.029	0.361
3 Years After Graduation			
Male (Reference)	-		-
Female	-5.92***		-1.12**
	(0.47)		(0.48)
Standard (Reference)		-	-
DEIS		-2.37***	-1.14
		(0.87)	(0.83)
Fee-Paying		6.49***	1.04
		(0.79)	(0.80)
Missing		8.86***	1.95**
		(0.90)	(0.92)
Observations	20,182	20,182	20,182
Adjusted R-squared	0.020	0.022	0.331

	Excluding New Entrant Info.		
	Gender	School Type	Full Model
4 Years After Graduation			
Male (Reference)	-		-
Female	-7.62***		-0.71
	(0.53)		(0.57)
Standard (Reference)		-	-
DEIS		-2.52**	-0.82
		(1.01)	(0.93)
Fee-Paying		11.32***	2.68***
		(1.04)	(0.96)
Missing		6.70***	0.85
		(0.96)	(1.02)
Observations	16,731	16,731	16,731
Adjusted R-squared	0.020	0.020	0.337
5 Years After Graduation			
Male (Reference)	-		-
Female	-9.43***		-1.03
	(0.61)		(0.68)
Standard (Reference)		-	-
DEIS		-3.71***	-1.98*
		(1.20)	(1.11)
Fee-Paying		14.06***	3.94***
		(1.30)	(1.19)
Missing		5.75***	0.60
		(1.00)	(1.12)
Observations	12,997	12,997	12,997
Adjusted R-squared	0.021	0.018	0.348
6 Years After Graduation			
Male (Reference)	-		-
Female	-10.67***		-1.41*
	(0.73)		(0.80)
Standard (Reference)		-	-
DEIS		-4.97***	-2.89**
		(1.47)	(1.40)
Fee-Paying		15.82***	2.36*
		(1.65)	(1.44)
Missing		2.59**	0.15
		(1.07)	(1.30)
Observations	9,671	9,671	9,671
Adjusted R-squared	0.020	0.014	0.355

	Excluding New Entrant Info.		
	Gender	School Type	Full Model
7 Years After Graduation			
Male (Reference)	-		-
Female	-12.79***		-2.82***
	(0.91)		(1.07)
Standard (Reference)		-	-
DEIS		-10.09***	-5.49***
		(1.95)	(1.91)
Fee-Paying		19.24***	5.71***
		(2.23)	(1.92)
Missing		-1.01	-0.79
		(1.24)	(1.61)
Observations	6,498	6,498	6,498
Adjusted R-squared	0.026	0.020	0.356
8 Years After Graduation			
Male (Reference)	-		-
Female	-14.79***		-2.99*
	(1.33)		(1.60)
Standard (Reference)		-	-
DEIS		-11.50***	-6.93**
		(2.95)	(3.19)
Fee-Paying		27.72***	16.53***
		(3.54)	(3.41)
Missing		-2.40	0.04
		(1.71)	(2.27)
Observations	3,242	3,242	3,242
Adjusted R-squared	0.032	0.028	0.396
Controls:			
Graduation Cohort	✓	✓	✓
Institution			✓
Course Name			✓
Award Type			✓
Final Degree Grade			✓
Gender	✓		✓
County of Origin			✓
Age at Entry to HE			
Leaving Certificate Points			
Leaving Certificate Maths			
Leaving Certificate English			
Second-Level School Type		✓	✓
School ED Deprivation Index			✓
Socio-Economic Group			
Mother			✓
Sector of Employment			✓

Note: *, **, and *** denotes significance at the 10%, 5% and 1% level respectively. Coefficients and standard errors (in parentheses) show percentage differences in females' earnings compared to males and percentage differences in each school types' earnings compared to standard schools. Models exclude new entrant information and are estimated for graduation cohorts from 2010 to 2017. The number of observations relate to the 'Total' in each respective year after graduation in Table A.4. The variables included in the set of controls are described further in Section 3.3 and Appendix B. The coefficients (and standard errors) have been transformed from log percentage points into percentage points using the transformation $100(e^b - 1)$ where *b* is the log percentage points coefficient. The delta method is used to transform the log point standard errors (*se*) to percentage points using the transformation $se \times 100(e^b)$.